AMERICAN GAS ASSOCIATION MONTHLY

Vol. I No. 5

May 1919

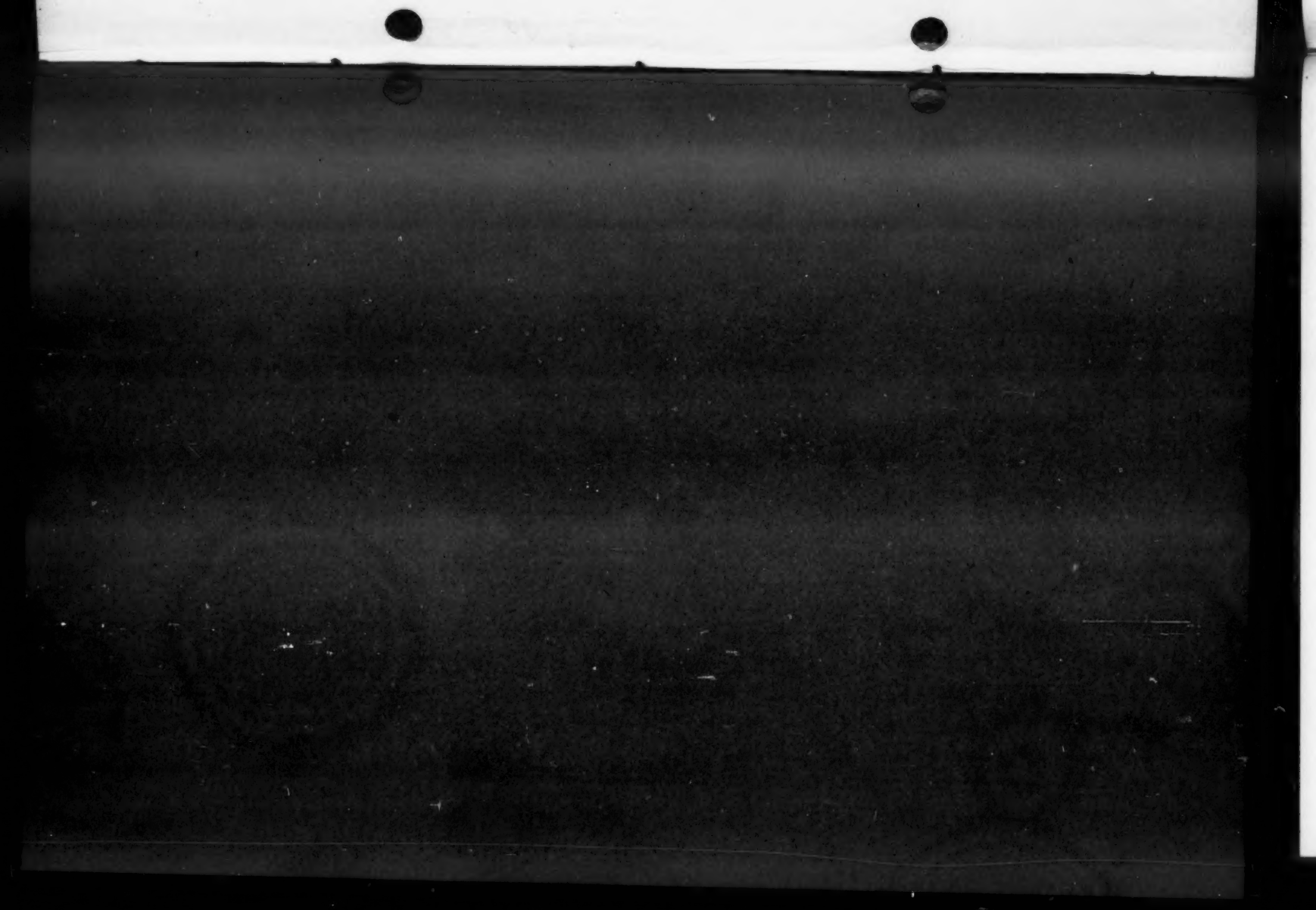
The Psychological Time

We want continued prosperity—there is no question on that point. Let us keep industry going to its fullest extent. By doing our share to encourage the "Buy Now, But Buy Wisely" idea, we can speed up peace production as we did war work in 1918.

An adequate campaign for prosperity for the gas industry we believe, must be built upon co-operation of all gas interests and the Association is developing its own work upon that principle. The Association requires both your help and your suggestions if our industry is to advance at its most rapid rate.

"Let's Go"

ENTERED AS MATTER OF SECOND CLASS AT THE POST OFFICE, EASTON, PA.
Acceptance for Mailing at Special Rate of Postage Provided for in Section 1103, Act of October 3, 1917, Authorized July 16, 1918



C O N T E N T S

VOLUME I MAY, 1919 NUMBER 5

PAGE

Affiliated Societies 249
Association Representations at Conventions..... 255
Bibliography of Gas Literature..... 300
Canadian Gas Association Convention..... 283
Chemical Abstracts 279
Classified Directory—Manufacturers' Gas Equipment..... 293
Convention—Hotel Reservations 254
Diplomas to Gas Men..... 280
Drip Pumping by Motor Wagon..... 278
Editorial—The Ideal Campaign 246
Educational Courses—Bound Volumes 281
Exhibition Plans and Exhibitors..... 253
Gas and By-Products in the War..... 266
Gas Manager Elected to Congress..... 256
Heat Economies at Rochester, N. Y..... 275
Heating Appliances 284
Heating Committee—Data Sheet 261
Illinois Gas Association—Committees 283
Incorporation of American Gas Association..... 246
Industrial Engineer at Wilmington..... 256
Industrial Fuel Engineering Service..... 260
Iowa District Court Decision..... 282
Kitchen Equipment of Hotel Pennsylvania..... 257
New Members—List 289
Rate Increase List 292
Secretary-Manager of Association, Col. Oscar H. Fogg..... 247
Technical Section—New Committees 264, 265
Water Heater Week, National..... 250
Window Displays for Water Heater Week.....251, 288

AUTHORS

W. H. Earle—Heat Economies at Rochester..... 275
Alfred E. Forstall—Educational Department..... 284
Walton Forstall—Drip Pumping by Motor Wagon..... 278
Horace C. Porter—Gas and By-Products in the War..... 266

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AMERICAN GAS ASSOCIATION
MONTHLY

ADDRESS ALL COMMUNICATIONS TO THE AMERICAN GAS ASSOCIATION, Inc.
130 E. 15th St., NEW YORK, N. Y.

Editor, ... Louis Stotz
Associate Editor, . T. M. Will

Vol. I MAY, 1919 No. 5

WITH THE EDITOR.

The Ideal Campaign

Special conditions, to be sure, call for special plans and treatment, whether the subject under consideration be the architecture of a palace or the selling campaign of a new notion. The really adequate sales manager is he who recognizes the special conditions when he meets them and makes plans which produce profitable results.

The Sales Development Committee, Sub-committee on Special Campaigns, has recommended most urgently to Association members, the celebration for both National Gas Range and National Gas Water Heater Weeks this year, because the existing set of circumstances justifies the exertion of special efforts at this time.

The selling of gas appliances has been curtailed in many a gas company because of priority restrictions, reduced sales forces, over demand on gas-making capacity, etc. The buying of standard gas appliances by the public through the gas companies has in many cases fallen off because of restricted sales effort by the company. Whatever the cause, selling by the gas company to the public needs special stimulation this year and the gas manager can have a free hand in providing it. Special campaigns and drives have been proved again and again to be entirely adequate methods of starting the selling and buying habits after any period of quiet.

The Committee, however, has made a point which we believe should be fixed in the mind of every gas manager or salesman. The total figure for yearly business—the record which puts a business organization into Class A or marks it as barely successful—is reached by constant, steady work. In fact, the sales campaign which represents so intensive an effort that with all of its excellent results, it leaves the sales force and even the field of prospects worn out, exhausted, may figure into the annual report as a real loss rather than a real gain.

The ideal sales campaign is an integral part of the sales plans of a whole year. It stimulates enthusiasm that may show the slightest signs of waning, and if it does not show a tremendous peak on the load line, it also eliminates the valleys and keeps the general daily and yearly average at the highest level possible with the given equipment and the community that is being served.

American Gas Association, Incorporated

The Certificate of Incorporation of "American Gas Association, Inc.," with acknowledgment thereto annexed, was filed and recorded in the office of the Secretary of State, of the State of New York, at Albany, on the third day of May, 1919.

Upon completion of the proceedings for incorporation, the Association announced its adoption of an official seal which will, henceforth, appear upon the stationery and all publications of the Association.

The seal was designed by Black, Starr & Frost, of Fifth Avenue, New York, and during the progress of its development had the careful attention of the President of the Association. With simple lines and clear-cut sketch that suggest dignity and power, the artist has indicated the name of the Association, its national character and the circle of essential products of the gas industry.

AMERICAN GAS ASSOCIATION MONTHLY

Vol. 1 MAY, 1919 No. 5

Oscar H. Fogg, Appointed Secretary-Manager of the American Gas Association

UPON the recommendation of a special committee consisting of H. C. Abell, Chairman; J. B. Klumpp, C. A. Munroe, A. B. Tenney and F. W. Frueauff, the Executive Board has unanimously elected Lt. Col. Oscar H. Fogg, recently of the Ordnance Department, United States Army, to the position of Secretary-Manager of the American Gas Association.

Mr. George B. Cortelyou, President of the Association, announces that Colonel Fogg has accepted this appointment, and has entered upon his new duties.

Both the special committee and the Executive Board have assumed as a serious responsibility their authority to recommend and elect a Secretary-Manager. It has been their intention since the inauguration of the Association, to select for this important office a man equipped with a thorough knowledge of all aspects of the industry which the Association represents and it is with the satisfaction of a duty fully performed that their choice is presented to the gas industry as a whole.

Oscar H. Fogg was educated in the public schools of Philadelphia. His first business experience was in a clerical position with The United Gas Improvement Company in Philadelphia; later, as a cadet engineer, he received practical experience in gas manufacture, plant construction and gas distribution at Yonkers, New York, and other United Gas Improvement Company plants in Westchester County.

From 1901 to 1902 Col. Fogg was superintendent of the Newtown & Flushing Gas Co., at Flushing, Long Island, and the following year he had charge of the construction of the gas works and distribution system at Ocean City, N. J., and of the operation of the plant on its completion.

The year 1904 saw the beginning of his employment by the Consolidated Gas Company of New York, where he remained until 1917, when he entered the military service, as a Captain in the Ordnance Department. His first work with the Consolidated Gas Company placed him in charge of the laying of 36-inch mains in New York City and later, he assumed the position of engineer of the Department of Mains and Services.

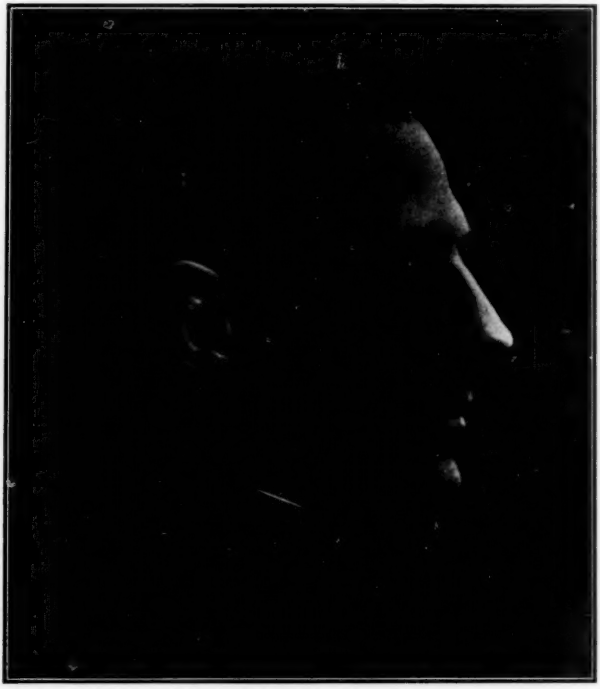
In 1910 he was assigned to special

work including the investigation of gas making processes and processes of combustion, the utilization of by-products, the valuation of plant property for court purposes, etc. During this period he made a study of methods for developing the utilization of gas in Europe and in the United States—a study of especial value to the commercial interests of the industry.

In 1912 Col. Fogg was appointed Engineer of Utilization, and organized the Department of Utilization of the Consolidated Gas Company of New York and its allied gas companies, to the development of which he devoted his energies until called upon to enter military service.

He was a director and member of the Executive Committee of the Municipal Lighting Company, and a member of various engineering and professional societies, among them the American Society of Mechanical Engineers, the American Society of Heating and Ventilating Engineers, the Society of Gas Lighting, the Society of Gas Engineering, the National Fire Protection Association, the Illuminating Engineering Society, the International Acetylene Association, the British Commercial Gas Association and the (British) Illuminating Engineering Society.

Col. Fogg was active in the work of both the American Gas Institute and the National Commercial Gas Association,



Lt. Colonel Oscar H. Fogg

and was treasurer and a director of the latter when he entered the Army. In 1913, representing the National Commercial Gas Association, he presented a paper describing its activities before a meeting of the British Commercial Gas Association in London.

He has been associated with the Bureau of Standards as a member of its Advisory Committee in the preparation of the National Gas Safety Code and served in a similar advisory capacity with the Industrial Commission of the New York State Department of Labor.

In September, 1917, Col. Fogg entered the military service as a Captain in the Ordnance Department, and was engaged in the design of plants and facilities for the repair and maintenance of ordnance material in France, and in the recruiting organizing and training of enlisted and commissioned personnel for this purpose.

In France, he was first engaged with troops on the construction of ordnance base shops, and subsequently appointed Chief of the Shop organization and Maintenance Section and placed in charge of the organization, installation and operation of repair and maintenance establishments. Later, he was made Chief of the Construction and Maintenance Division of the Ordnance Department in France, the division which had supervision over all construction work and the operation of all repair and maintenance activities of the Ordnance Department in the American Expeditionary Forces, including the large base shops and the numerous smaller shops throughout France. Col. Fogg was honorably discharged from military service on March 31, 1919.

Co-Operation Between Gas Societies

A FULL realization of the close community of interest that exists between gas companies and their employees in different parts of the country led the American Gas Association to draw up, for the consideration of various local and state societies, an affiliation agreement as printed in full in the March number of the Association MONTHLY.

The local societies are also keenly alive to the co-operation which will promote, not only the best interests of the industry as a whole, but the best interests also, of the local companies and the local societies.

The New England Association of Gas Engineers signed the agreement on February 19, 1919. Since that date the following have indicated their desire and intention of working with the national organization:

March 19, 1919—Illinois Gas Association, Chicago, Ill.

March 25, 1919—Canadian Gas Association, Toronto, Canada.

March 25, 1919—Wisconsin Gas Association, Milwaukee, Wis.

April 10, 1919—Pennsylvania Gas Association, Jenkintown, Pa.

April 24, 1919—Indiana Gas Association, Evansville, Ind.

April 25, 1919—New Jersey State Gas Association, Millville, N. J.

(Continued on page 255)

National Gas Water Heater Week June 9-14, 1919

THE second "hop" on the flying trip to renewed sales activities for gas companies, with an "ocean" of gas heated water to measure the record.

Every representative of the gas industry has long since been convinced that the gas water heater is a means for increasing his output of gas, a most desirable means and an unlimited prospect field in which to work.

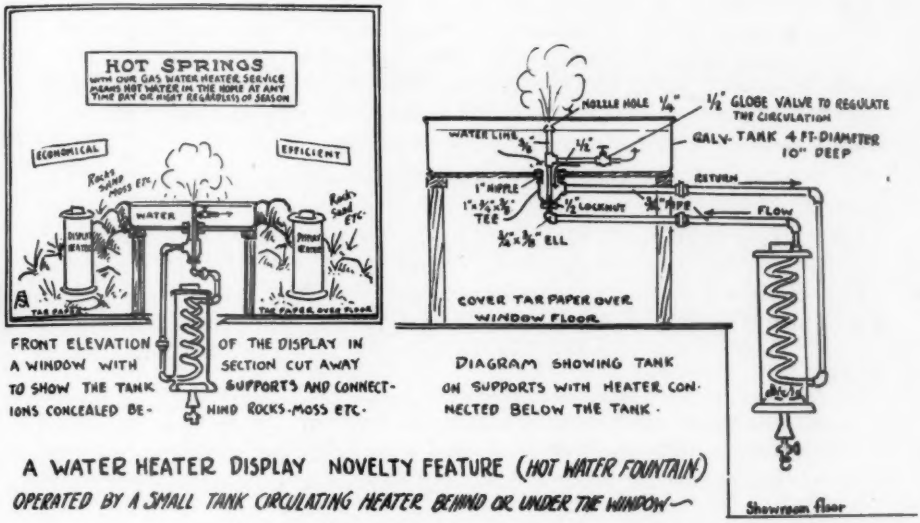
In the first place, gas water heating produces its peak consumption at a time of the year when it is most welcome. In the second place, intensive efforts devoted to the sale of gas water heaters will show a high percentage of results and the development of a most profitable field. Gas water heaters almost always represent new installations—not replacements—and their use, though begun on a small economical scale, is bound to expand as the consumer becomes educated to the real convenience of "hot water always on tap" and the real necessity of hot water in home, shop, hospital, church kitchen and clubroom.

The appeal to the public may be made in any number of ways, and every gas water heater manufacturer is prepared to furnish sales arguments to further the introduction of his line.

The one appeal, however, to present to the public this year, as the cardinal reason for installing a gas water heater, is the sanitary appeal. The two ideas of cleanliness and hot water have become almost inseparable in our minds, and conditions and events of the past winter and of the past two or three years have emphasized the supreme value of absolute cleanliness in town, home and institution. Why not make use of the fact in selling gas water heaters, the most convenient and surest and the most economical means of securing a pan full or a tub full of hot water?

The Surgeon General of the U. S. Public Health Service has recently sent out to all mayors, health officers and citizens interested in the health of their communities an open letter labeled "Is Your Community Fit?" It's slogan is "Public health is purchasable." Urge your community to do its part in the great health campaign by using every means to maintain absolute cleanliness on all sides, and make the connection between this state and the equipment of homes with really adequate supplies of hot water. What community supplied with running water would return to the days of wells and pumps? And yet a supply of running *hot* water is as essential—especially in crowded town quarters—for health, comfort and convenience. National Gas Water Heater Week is the time to begin an aggressive campaign for the sale of gas water heaters.

National Gas Water Heater Week has met with marked success in the past by those companies that have celebrated it with special sales. Many plans have been tried and have proved remunerative; and frequently the more simple and striking a plan, the more satisfactory has been its results. One of the most important requisites of any campaign, however, is an organization in hearty accord


HOT SPRINGS
WITH OUR GAS WATER HEATER SERVICE
MEANS HOT WATER IN THE HOME AT ANY
TIME DAY OR NIGHT REGARDLESS OF SEASON
ECONOMICAL
EFFICIENT
WATER
FRONT ELEVATION OF THE DISPLAY IN A WINDOW WITH SECTION CUT AWAY TO SHOW THE TANK SUPPORTS AND CONNECTIONS CONCEALED BEHIND ROCKS-MOSS ETC.
DRILL HOLE 1/4"
1/2" GLOBE VALVE TO REGULATE THE CIRCULATION
WATER LINE
GALV. TANK 4 FT. DIAMETER 10" DEEP
RETURN
1" NIPPLE
FLOW
COVER TAR PAPER OVER WINDOW FLOOR
DIAGRAM SHOWING TANK ON SUPPORTS WITH HEATER CONNECTED BELOW THE TANK.
A WATER HEATER DISPLAY NOVELTY FEATURE (HOT WATER FOUNTAIN)
OPERATED BY A SMALL TANK CIRCULATING HEATER BEHIND OR UNDER THE WINDOW
Showroom floor

Mechanical Window Display for Gas Water Heater Week

Description of Mechanical Display for Gas Water Heater Week

DESCRIPTION—A large galvanized tank elevated on wood framework, near the center of the window, has a hole made in the bottom with a 1-inch nipple inserted and made water tight by soldering to the bottom of the tank or with lock-nuts or washers. A 1 by ¾-inch side outlet, by ⅜-inch lower outlet tee is screwed to this nipple. A ⅜-inch pipe with a long thread at the lower end and a nozzle with a somewhat smaller opening in it at the upper end, is screwed through the ⅜-inch end of the tee to allow for a lock-nut and elbow thread. The nozzle should extend to ½ inch above the desired water level in the tank. A tee and a valve should be inserted below the water level of the tank to relieve the pressure and regulate the fountain action. The return to the water heater is connected through the side tee connection and the flow is joined at the bottom of this same tee. If carefully piped this should give a strong spouting action at the nozzle.

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with all details of the sale. The co-operation of all departments of the entire company is decidedly necessary.

Upon such an occasion as National Gas Water Heater Week, extra advertising, simple but attractive, should be distributed through newspapers, gas bills, wagon posters, wrappers around merchandise, outgoing mail, and pamphlets telling of the convenience and desirability of having an adequate supply of hot water at one's command.

There should be attractive window and floor displays. This page shows a mechanical device that is bound to attract attention, and the American Gas Asso-

ciation Window Display Service for May includes two excellent window trims for the campaign. Special inducements should be offered to encourage the prospect; liberal prices, special discounts, easy terms for payment, no money down at the time the order is taken, free connections, special concessions to those who order their coal ranges removed or who accept a combination offer in which a gas range and a gas water heater are installed at the same time.

Participation in National Gas Range Week affords the salesman an excellent opportunity in which to secure a large list of prospects for water heater sales, and the sales force should be well primed for the additional opportunity offered by National Gas Water Heater Week. They should be thoroughly instructed to meet any situation that a prospect may suggest. Any sales plan that is decided upon should include ways and means for paying the sales representatives particularly well. These men must have an incentive if they are to produce telling results.

Employees of other departments of the company should be given special training and be held in readiness if required on the sales floor to wait on customers during rush hours. Prompt and courteous attention to prospective customers is essential. They should not be permitted to wait and thus lose the interest and enthusiasm which it has taken weeks of publicity and advertising to arouse.

Be prepared to render good and efficient service in having the water heaters installed promptly. Should one find that one is unable to cope with the situation, then sell the heaters with a definite understanding as to when the work will be completed.

The suggestions published in the National Commercial Gas Association's BULLETIN of June, 1917 will be of great assistance to sales managers who have not used the entire layout in previous water heater campaigns. Those who have used the suggestions, we believe have had sufficient experience to compile such plans as will best suit their local conditions. We all have our hobbies as to how a campaign should be planned and conducted. Formulate your plans, work out the details, and put them in successful operation. Then send your story to the editor of the Association MONTHLY. And above all, let your water heater campaign be the start of a continued drive.

(*See page 288*)

National Gas Water Heater Week

JUNE 9-14, 1919

Plans for First Annual Exhibition Taking Form

WITH a list of 70 exhibitors already awaiting the allotment of spaces on the exhibition floor of the Hotel Pennsylvania, in connection with the first Annual Convention of the American Gas Association, it would appear that the Manufacturers' Committee headed by Chairman A. P. Brill, and Secretary W. W. Barnes, had indeed been busy.

The Committee is making every effort to inform all prospective exhibitors of the general regulations which are to govern the displays in order that plans may be perfected and the best possible results obtained with no loss of space or time.

The interest and value of the Exhibition to the gas company and individual members of the Association are assured by that regulation which bars as exhibitors those companies whose advertising material has been questioned by the Executive Board.

Representatives of the exhibitors will be admitted to the hall by Saturday morning, October 11, but the doors will be formally opened on Monday, October 13, at 10 A. M.

Of special interest to exhibitors are the arrangements of the Committee to supply all booth furniture—to consist in each case of one table, three chairs, decorations and signs to designate the name of the exhibitor and the nature of his wares. The exhibitor will be permitted to use, in addition, small signs, 10 by 12 inches, to designate individual appliances. These he must furnish for himself.

The Committee will supply gas for lighting appliances, gas irons, and small specialties or for new appliances where it deems a demonstration necessary. Permission will be granted for pipe structures to display gas lights and hanging fixtures but these in all cases must fall within the measurements of the booth, must not exceed 12 feet in height, must rest on the floor without nails or screws, and must be painted white. No souvenirs are to be given away and all advertising material except catalogs, must be approved by the Committee before it can be distributed.

Exhibitors are being cautioned to keep their exhibits well within the measurements of the space allotted. Experience has shown again and again that one or two objects carefully displayed produce a more favorable effect and sell more goods eventually than a complete line crowded into a space too small to accommodate it.

The Committee announces that a special meeting will be held in the near future to determine the allottment of spaces so that exhibitors may proceed with the details of their plans. The floor of the main exhibition hall has already been completely filled and later applicants will be assigned to the spaces on the balcony.

An authoritative rumor has it that the 1919 exhibition will have special interest for all gas men because of the showing and demonstration of new processes or accessories which have been developed since the war. The 1919 exhibition—the first under the auspices of the American Gas Association—also promises a new departure in the display of gas machinery and materials. Whereas former exhibitions have been confined almost

entirely to appliances, both gas men and their guests at the Hotel Pennsylvania will find that special value has been given the display at the Convention this Fall by the presentation of all aspects of the industry on the exhibition floor.

Applicants for Space at October Exhibition, Hotel Pennsylvania

A-B Stove Co., Battle Creek, Mich.
American Meter Co., New York, N. Y.
American Stove Co.—Geo. M. Clark & Co., Div., Chicago, Ill.
American Stove Co., New Process Stove Co. Div., Cleveland, Ohio
American Stove Co.—National Stove Co. Div., Lorain, Ohio
American Stove Co.—Reliable Stove Co. Div., Cleveland, Ohio
Will W. Barnes, East Orange, N. J.
James B. Clow & Sons, Chicago, Ill.
Celite Products Co., New York, N. Y.
Claus Automatic Gas Cock Co., Milwaukee, Wis.
Connelly Iron Sponge & Gov. Co., New York, N. Y.
Cutler-Hammer Mfg. Co., Milwaukee, Wis.
William M. Crane Co., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Equitable Meter Co., Pittsburgh, Pa.
Eriez Stove & Mfg. Co., Erie, Pa.
Geist Mfg. Co., Atlantic City, N. J.
General Briquetting Co., New York, N. Y.
General Fire Extinguisher Co., Providence, R. I.
General Gas Appliance Co., New York, N. Y.
General Gas Light Co., New York, N. Y.
Illinois Specialty Co., Bloomington, Ill.
Isbell-Porter Co., Newark, N. J.
John J. Griffin & Co., Philadelphia, Pa.
Humphrey Co., Kalamazoo, Mich.
Wm. Kane Mfg. Co., Inc., Philadelphia, Pa.
Lawson Mfg. Co., Pittsburgh, Pa.
Lindsay Light Co., Chicago, Ill.
Meek Oven Mfg. Co., Newark, N. J.
Metric Metal Works, Erie, Pa.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
H. Mueller Mfg. Co., New York, N. Y.
National Tube Co., Pittsburgh, Pa.
F. W. Ofeldt & Sons, Nyack, N. Y.
Pittsburgh Water Heater Co., Pittsburgh, Pa.
Precision Instrument Co., Detroit, Mich.
Rathbone Sard & Co., Albany, N. Y.
Reznor Mfg. Co., Mercer, Pa.
Roberts & Mander Stove Co., Philadelphia, Pa.
Ruud Mfg. Co., Pittsburgh, Pa.
B. Ryan & Co., New York, N. Y.
Shapiro & Aronson, Inc., New York, N. Y.
Steere Engineering Co., Detroit, Mich.
Strause Gas Iron Co., Philadelphia, Pa.
Superior Meter Co., Brooklyn, N. Y.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Bartlett Hayward Co., Baltimore, Md.
The G. S. Blodgett Co., Burlington, Vt.
The Bryant Heater & Mfg. Co., Cleveland, Ohio
The Cleveland Heater Co., Cleveland, Ohio
The Crandall Pettee Co., New York, N. Y.
The Estate Stove Co., Hamilton, Ohio
The Hoffman Heater Co., Lorain, Ohio
The Improved Appliance Co., Brooklyn, N. Y.
The C. M. Kemp Mfg. Co., Baltimore, Md.
The Lattimer Stevens Co., Columbus, Ohio
The Long-Landreth-Schneider Co., New Brunswick, N. J.
The Mead Gas Heater Co., Delawanna, N. J.
The Michigan Stove Co., Detroit, Mich.
The Peninsular Stove Co., Detroit, Mich.
The Roberts Brass Mfg. Co., Detroit, Mich.
The Safety Gas Lighter Co., Haverhill, Mass.
The Sprague Meter Co., Bridgeport, Conn.
The Surface Combustion Co., New York, N. Y.
The Union Steel Products, Ltd., Albion, Mich.
The A. H. Wolff Gas Radiator Co., New York, N. Y.
United Lead Co., New York, N. Y.
Union Stove Works, New York, N. Y.
Weir Stove Co., Taunton, Mass.
Welsbach Co., Gloucester, N. J.
Young Brothers Co., Detroit, Mich.

Reservations at Hotel Pennsylvania

Definite arrangements have been made with the Hotel Pennsylvania for taking care of room reservations for Association members who plan to attend the Annual Convention, October 13-18, 1919.

The Pennsylvania will be headquarters for both Convention and Exhibition and all delegates or guests are urged to secure accommodations in the hotel. Reservations should be made as early as possible directly to Mr. Roy Carrothers, Manager, at Hotel Pennsylvania, 7th Avenue & 32d Street, New York, N. Y., and to avoid any delay or confusion, specific mention should be made of the American Gas Association Convention.

(*Continued from page 249*)

The desired co-operation is to be obtained by an interchange of representation between the organizations concerned. As at present constituted, the American Gas Association has four Managing Committees for the four sections which carry on its work. The affiliated society is privileged to select from its membership list, a representative to sit with each of these committees, provided only that the chosen representatives shall also be members of the American Gas Association and approved by that organization. The value of this privilege must be clear when the extreme importance of the Managing Committees in the organization of the Association is realized.

In turn, the Association is permitted to appoint a delegate to represent it at the annual convention of each affiliated society, and to this delegate will be granted the privileges of the floor and of the session.

The Association's data files and special investigations are at the service of the affiliated societies, which are permitted to consult and bound to consider the advice of the Association's committees in matters of *national* concern to the gas industry. The columns of the Association MONTHLY will also be open for announcements and news items concerning the affiliated societies.

It is the belief of the Association that this agreement of affiliation between the national and the state or other local gas organizations will eventually bring about a more thorough co-operation between various parts of the industry and will give greater importance and greater opportunity for wide spread publicity, to the activities of both the local and the national associations that are working for the prosperity and development of the one industry.

Association Representatives at Big Conventions

AS a part of the policy of the American Gas Association to establish close relations with various branches of activity of interest to the gas industry, particularly as expressed in local or specialized societies and organizations, the Association will have representatives at three big Conventions which are scheduled for May.

Mr. George B. Cortelyou, President of the American Gas Association, will be present at the Annual Convention of the Natural Gas Association of America to be held at Cleveland, Ohio, on May 20, 21 and 22.

Mr. Oscar H. Fogg, Secretary-Manager, will represent the Association at the Annual Convention of the National Electric Light Association which is being held at Atlantic City, N. J., on May 19-22.

The Southern Gas Association will hold its Convention at Asheville, N. C., on May 20, 21 and 22, and Mr. Louis Stotz, Assistant-Secretary Manager, will be present to represent the national organization.

It is the Association's intention thus to keep in close touch with the important work undertaken by other organizations, and at the same time to spread among the societies and individuals interested in the gas or allied industries, information concerning the work and the progress of the American Gas Association.

An Inspiration to Gas Men

MR. C. O. BOND has recently sent us a most interesting and inspiring account of the career of a gas man. Starting as a lamplighter, Mr. James W. Dunbar, of New Albany, Ind., made his way through the various stages of the gas business and then "graduated," as Mr. Bond puts it, "from company service to national service," when he was elected Congressman as a mark of the esteem in which he is held by the community for which he has made gas for forty years.

Mr. Dunbar's first connection with the prospering gas company of New Albany, began some forty-six years ago when he undertook to light and extinguish the town's gas lamps before and after his hours in high school. Even so humble a job offers a chance to make good, and the first promotion put the young man into a place in the gas plant. Then came the invitation to lend his brain also to the plant and Mr. Dunbar was made superintendent and later, manager.

When Mr. Dunbar was asked, after his election, to outline his hopes, he responded: "Having little of wealth or influence, I shall not be sought out for my power. Neither my age nor my inclination tend toward social achievement and thus that avenue of activity is by-passed. Nobody ever accused me of eloquence; so the Congressional Record will need no extra pages for me. What I expect to do is just plain work and plenty of it."

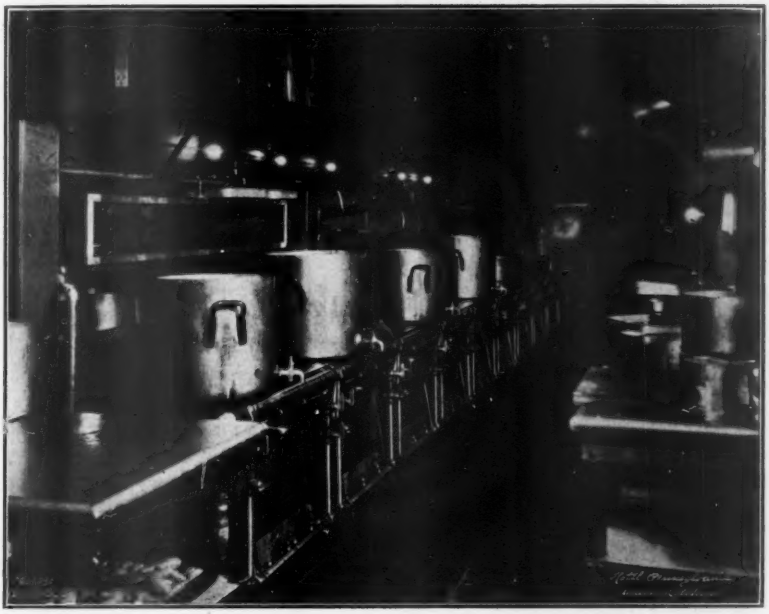
It is undoubtedly true that the same spirit which makes a man "keep gas on the town at all hazards" will be a valuable asset in our public life, as it is true that the man who puts the best of his abilities into serving his community, becomes, after a due period, a recognized personality in that community.

Mr. James W. Dunbar

The photograph herewith shows Congressman Dunbar at his desk in the gas office. Through the door can be seen the old station meter which has recently been overhauled and continued in service with increased capacity.

Mr. Ehlers at Wilmington

Arrangements have just been concluded with Mr. H. S. Schutt, General Manager of the Wilmington Gas Company, of Delaware, whereby Mr. W. A. Ehlers, the Industrial Fuel Engineer of the American Gas Association will spend thirty days or more with the Wilmington company in making a survey of industrial gas prospects and investigating special utilization problems.



Convention Headquarters Unique in Gas Equipment

WHEN the gas men of the country assemble at Hotel Pennsylvania on October 13 for the first annual Convention and Exhibition of the American Gas Association, they will have in addition to what promises to be the biggest and most important of gatherings called by the industry, an opportunity to see the biggest gas installation in the biggest hotel in the world. Such are the claims of the press agent and his statement has not yet been contradicted.

Before giving the details of the gas equipment which will add to both the comfort and the interest of gas men who attend the convention, it may be well to enumerate some of the remarkable features of the hotel which put it first both in size and in other qualities, among modern hostelries.

The hotel occupies a site 200 by 400 feet on Seventh Avenue, between 32nd and 33rd Streets, directly opposite the Pennsylvania station. It consists of three levels below ground and twenty stories from street level to roof, on top of which is a penthouse of three more stories.

The guests are cared for in 2,200 rooms and the public apartments, that is, the lobby, rest and writing rooms, library, dining rooms, etc., cover a total of 2¼ acres of floor space.

To judge the size of the kitchens, storerooms, engine rooms and laundry one must visit these places for himself.

On the main floor one finds a buffet and a cafe, each larger than the main dining rooms of the average big hotel. To the rear of the lobby is a tea room

NOTE: View of one side of main battery. Roasting ovens in extreme background. The constant rush in this kitchen made it impossible to get an adequate photo of the really beautiful layout.

lounge and to the right of this, the main dining room, covering a space 142 feet long by 58 feet wide.

On the ballroom floor, one short flight up, is a series of parlors suitable for either meeting rooms or small banquet halls. On this floor there is also the grand banquet hall for formal dinners of societies and clubs. Opposite is another line of private dining rooms.

The basement contains a lunch room equipped with counter and stools, and a grill room designed as a series of Italian grottoes with tables on three levels. The plans also call for a restaurant on the roof of the hotel and this has its own gas-equipped kitchen and service pantry.

Just this enumeration of the dining rooms of the hotel will give the gas man something of an idea concerning the size and variety of the gas equipment necessary to supply boiled, baked, broiled, fried, stewed, roasted, toasted, grilled, brewed and percolated foods at the temperature and speed of cooking that make for first class service only. At present 9,000 meals per day are being served.

Mr. R. V. Howes of the Consolidated Gas Company of New York, has given us the following facts and figures concerning the gas equipment and its distinctive features and innovations that will interest every gas man, who during his stay at convention headquarters, should make it his business to visit the various kitchens and see for himself what is believed to be the largest hotel equipment in the world.

The hotel was built by the Pennsylvania Railroad Company, with McKim, Mead & White as architects, and then turned over to the Statler Hotel Company for operation. Mr. Statler, from the first, chose the gas equipment in preference to other installations. This fact makes the hotel's gas equipment unique, in that its ranges and other kitchen apparatus were a part of the plans as originally approved, while practically all of the other large hotels of New York began with coal burning ranges and installed later a gas equipment that had to be accommodated to existing conditions.

The New Amsterdam Gas Company, an allied corporation of the Consolidated Gas Company of New York, secured the contract for the complete gas equipment for all the kitchens. Later the contract for the broilers and special hot plates and griddles was relinquished in favor of a gas equipment company. All of the ranges and salamanders, however, were furnished by the gas company and installed under its inspection. The size of the battery of ranges was reckoned according to the number of chairs in the dining rooms—4,500 for the completed plans—and the location and sizes of pipes, outlets and flues were all determined by the gas company.

The hotel is equipped with piping for emergency lighting in halls and stairways and the gas is supplied through two 6-inch services coming into the building from two parallel streets. These enter the meter room where four 150 A- J. J. Griffin meters have carried the load, to date, with a drop of only 3/10 inch. The possibility of a shut down due to accident in either street, is avoided by the use of two lines, and the fitting of all meters with by-passes safeguards the house supply in case a meter must be changed.

The house piping, all of which was run by the plumbing contractor for the building, is 6-inch for 70 feet, and then branches to one 5-inch and one 4-inch pipe.

The equipment of the main kitchen consists of 20 sections of Garland 45-26

P. hotel ranges, with four 16-30 C. salamanders, one double unit of Dupargnet, Hout & Moneuse broilers (6 feet long) one battery of twelve gas ovens set double deck and a 4-foot D. H. & M. toaster (two compartments) set at one end of the broilers.

This main battery of ranges is set in what New York calls the Waldorf style because the first equipment in this fashion was put into the Waldorf-Astoria. The ranges are set back to back. The back plate of the range with its usual flue opening is removed and a solid plate substituted therefore. An opening is then made on the bottom of the flue chamber of the range top, and a flue is run between the ranges, below the projecting chamber of the range top.

This permits of a clear passage beneath the high shelf, and allows vessels to be passed from one side of the battery to the other, across the ranges.

In the Pennsylvania, it was impossible to locate the flue outlet in the floor, so a flue was provided overhead, and a pipe at each end of the main battery was run up to this. In order to avoid eddy currents, the main flue was divided in the center of the battery.

After the ranges were completely assembled and connected, it was necessary to balance the flue draft to each individual range by a permanent damper in each section branch.

In the pastry shop there is a 4-foot D. H. & M. griddle, a 4-foot waffle stove and a 4-foot D. H. & M. hot plate. The service pantry has two 18-inch toasters and one 24-inch hot plate (D. H. & M).

The basement lunch room is equipped with two 45-26 P. Garland ranges, one 16-30 C. Garland salamander, two 15-inch D. H. & M. toasters and one D. H. & M. 36-inch waffle stove.

The first floor kitchen has six Garland 45-26 P. hotel ranges with two Garland 16-30 salamanders and two 524 Garland broilers.

The roof kitchen has 11 sections of Garland 45-26 P. hotel ranges, two 16-30 C. Garland salamanders and two 30-inch D. H. & M. broilers and in the adjacent service pantry there is one 30-inch D. H. & M broiler and one 30-inch D. H. & M. hot plate.

In the sub-basement is situated a kitchen for the help other than chefs, etc., and this is equipped with three sections of 45-26 P. Garland hotel range.

All the ranges are fitted with the Garland double-deck, high shelf and the special high shelf in the Waldorf style, as used in the main kitchen, was also built by the Michigan Stove Company.

The gas company maintains a regular inspection service for all hotel installations and thus keeps the burner equipment in good condition.

The total demand load of the hotel kitchens figures 10,700 cubic feet per hour with about 1,500 more for the emergency lighting. Though the entire load has not been put on (the roof restaurant is not as yet operating) the total gas output exceeds that of many towns in the United States, and about equals the average town with 2,000 meters.

It may be noted that the hotel contains one electric kitchen equipped with 10 feet of electric range, used for so-called "home" cooking.

The management of the Hotel Pennsylvania has extended a cordial invitation to gas men attending the convention, to visit its kitchens and members of the Association who desire to take advantage of this invitation are asked to leave a note of the fact with the Association clerk in charge of the convention registration desk.

Industrial Fuel Engineering Service

Association Engineer Replaces Producer Plant at Rome, N. Y., with Gas from the Local Company

ABOUT two months ago a letter was sent to all company members, announcing that Mr. W. A. Ehlers, who was formerly connected with the National Commercial Gas Association, had joined the staff of the American Gas Association after a period of absence during which he was engaged in the erection of toluol and light oil recovery plants for Government war uses.

When the National Commercial Gas Association in April, 1916, publically announced the inauguration of its Special Industrial Fuel Service, Mr. A. B. Morton, Manager of the Rome (N. Y.) Gas, Electric Light & Power Co., was the first to take advantage of the service and again early in this year when Mr. Ehlers took up the work under the new Association, Mr. Morton was the first to call for further assistance on industrial problems in Rome.

Two recent visits of one day each to this situation were sufficient to convince the management of a large brass and copper company in Rome that producer gas made at their plant was not only far inferior to but much more expensive than city gas as a fuel for brazing brass tubing.

Briefly, this situation may be stated as follows: Four tube brazing furnaces 9 inches wide by 9 inches high by 6 feet long, were operated with anthracite coal for a number of years. About two years ago, the manufacturing company installed a producer plant to supply fuel for the furnaces. After giving the installation a thorough tryout, it was found that a great deal of time was lost on account of numerous break-downs and other troubles which necessitated the stopping of gas making operations. In addition, the sulphur fumes from the producer gas were very objectionable to the workmen and caused a spirit of dissatisfaction among them.

At this point the Association's Industrial Engineer was called in by the Rome Gas Company and after making a careful study of the situation, he proposed the installation of a single valve air-gas system and burner equipment on the existing furnaces. The proposal was immediately accepted by the manufacturing company and an order given at once for the equipment. When the system had been in operation a short time the following comparative results were noted:

Producer Operation:		
1½ tons coal per 10-hour day at $9.90 per ton...	$14.85	
Labor cost per day.....	7.00	
		$21.85
Operating 5 furnaces* 12,000 cubic feet of gas per day at $0.90 per M.....		10.80
Saving per day.....		$11.05

(*Four of the original producer gas furnaces converted to the new system, and one portable two-valve gas furnace.)

It is extremely interesting to note another feature of this installation. Before the installation of the new one-valve air-gas system, the portable furnace was heated with gas from the local gas company, using the ordinary two-valve system with air supplied by a positive pressure blower. Under normal work-

ing conditions this furnace consumed 350 cubic feet of gas per hour. When operating it together with the four producer gas furnaces, with the one valve air-gas system, the gas consumption was reduced to 266 cubic feet per hour and subsequently this has been further reduced to 240 cubic feet per hour, good evidence of the economy to be obtained by the use of the single valve system of burning gas.

Ever since the inauguration of the Association's Industrial Fuel Service, the Rome company has been an enthusiastic believer in the value of the service. During the short time in which they have used it, *new* industrial business amounting to 13,000 cubic feet per hour connected load has been added, 55 per cent. of which is subjected to a 24-hour demand.

The service, as planned and directed for the Association by a special committee of its industrial men, brings within the reach of every gas company, assistance of a grade that usually is available only for permanent engagements and at a high figure. The co-operative idea permits a gas manager to secure the special help of a man whose experience covers conditions of all kinds and degrees, and for a period varying to suit the appropriation made by the company, or the number of prospects presented by the district. Every gas company management is urged to consider the advantages which this Industrial Fuel Engineering Service offers and to make early arrangements to secure its full share.

Heating Committee of Commercial Section Active

HOUSE heating with gas is one of the big prospect fields for gas business in the future. With this in mind, the Managing Committee of the Commercial Section has selected a Heating Committee whose function it shall be to collect and compile data from all available sources covering gas house heating installations; to discover the actual status of the gas house heating load in various parts of the country and to tabulate information received from gas men who are in a position to form authoritative opinions concerning the value and possibilities of future development along this line.

The Heating Committee as at present constituted, includes the following men—each appointed because of some special experience or interest in the house-heating question.

HEATING COMMITTEE

George S. Barrows, Co-Chairman, Providence, R. I., General Fire Extinguisher Co.

W. W. Cummings, Co-Chairman, Boston, Mass., Boston Consolidated Gas Co.

George E. Bennitt, New York, N. Y., Consolidated Gas Co.

C. L. Bryant, Cleveland, Ohio, Bryant Heater & Mfg. Co.

J. J. Burns, St. Louis, Mo., Laclede Gas Light Co.

E. V. Dailey, Chicago, Ill., James B. Clow & Sons.

C. B. Elmer, New York, N. Y., General Gas Appliance Co., 103 Park Ave.

Charles Frary, Chicago, Ill., 8517 Sangamon St. (Bryant Heater & Mfg. Co.)

A. H. Humphreys, New York, N. Y., General Gas Light Co.

Frank L. Kay, New York, N. Y., Consolidated Gas Co.

R. Kidde, New York, N. Y., 169 Chambers St.

Thomson King, Baltimore, Md., Consolidated Gas, Electric Light & Power Co.

R. E. Landers, Tonawanda, N. Y., Niagara Light, Heat & Power Co.

L. H. Newbert, San Francisco, Cal., Pacific Gas & Electric Co.
W. H. Taylor, Omaha, Nebr., Omaha Gas Co.
F. S. Wade, Los Angeles, Cal., Southern Counties Gas Co.
C. C. Winterstein, Philadelphia, Pa., The United Gas Improvement Co.

The committee has had several meetings to consider the initiation of its work and as a result, the following questionnaire has been prepared for the gathering of data on a large number of gas heating installations.

Each installation is to be recorded on a separate sheet with a duplicate for the informer's files. Exact answers to the questions are requested wherever it is possible to supply the information without too great a demand on the gas man's time but, realizing both the difficulty and the demand upon time in such cases, the committee has indicated those questions in answer to which, approximate information will be valuable.

Each company member of the Association will receive a sample of the data sheet in duplicate, together with a copy of the following letter:

"The Heating Committee of the American Gas Association is making every effort to secure data from which an intelligent and trustworthy report of value to all gas men can be made up, to cover the subject of house heating by gas. We are assuming your willingness to assist us by filling out, for as many installations as possible, data blanks like the enclosed sample.

"We shall be able to use, in most cases, answers from memory, thus relieving you of the task of careful checking, but we ask for answers to every question on the blank. The duplicate is to be detached and held in your files as a record. This makes it possible to omit name and address of the installation, which will be referred to by the serial number on the blank.

"Every case which you tabulate will make the report more reliable, and we urge you to fill in as many blanks as possible. The required number—one for each case—will be sent you as soon as we have received your order on the return card enclosed.

Very truly yours,
W. W. CUMMINGS,
G. S. BARROWS,
Co-Chairmen."

When the correspondent has indicated the number of blanks his company can use, a supply will be forwarded to him at once.

Every reader of the Association MONTHLY who has information concerning one or more cases of gas house heating is urgently requested to write to Association headquarters for copies of the data blanks.

The Heating Committee is at work on a question of the utmost importance to the industry and merits in its attempts to supply information and opinions of real authority, the co-operation of every gas and manufacturer company as well as the assistance of every individual.

AMERICAN GAS ASSOCIATION, INC.

Data Sheet, HEATING COMMITTEE

Please refer to this blank by this number.....

Please fill out and return as soon as possible to

GEORGE S. BARROWS, *Co-Chairman,*
275 West Exchange Street,
Providence, R. I.

1. City where building is located.....
2. Occupancy—residence, store, church, or.....
3. Exposed (as an isolated building) or protected (as in a block)?.....
4. * Exposed walls, square feet N.....E.....S.....W.....

5. Construction, material .....
6. * Well built, or poorly built?.....
7. Number of full stories.....half stories.....
8. * Total contents of building in cubic feet.....
9. * Portion of building heated.....
10. Is gas the only fuel used for heating?.....
11. * If other fuel is used state what it is and give portion of building heated with gas .....
12. * Window surface, large.....small.....or average.....
13. * Are storm windows used?.....What portion?.....
14. * Number of rooms.....Number heated with gas.....
15. * What is the average temperature maintained?.....
16. Is thermostatic control used?.....
17. Make of control .....
Remarks .....
.....
.....
18. Character of heat (GAS)—steam, hot water, hot air or.....
.....
19. Name of maker .....
20. Catalogue name and number.....
21. * Hot water or steam, square feet of radiation.....
* Hot air, number of register openings.....
22. Formula used for calculating radiation (give name if possible, or if it is special, indicate this and send a copy to the Committee, if convenient)
.....
23. Maximum cubic feet per hour for which heater is set.....
24. Is gas used for cooking.....lighting.....heating water.....
other purposes? .....
25. If other fuel is also used for these purposes, what portion is gas?.....
26. Is heating gas metered separately?.....
27. B. t. u. value of gas.....
28. Gas consumption 1918-19 If possible give previous years

June.....Dec.....	.....
July .....Jan.	.....
Aug.....Feb.....	.....
Sept.....Mar.....	.....
Oct. .....Apr.....	.....
Nov.....May.....	.....

29. * Give coal used previously per year in (long or short) tons.....
30. Reasons for using gas for heating.....
.....
.....
Data submitted by.....
Address.....

Answers should be as full and accurate as possible. If inconvenient to give accurate or full information, those marked * may be approximated.

If you have information on a gas house heating case write for a blank, or send in your data on a typewritten sheet.

CHART OF TECHNICAL SECTION COMMITTEES

J. B. Klumpp, Chairman - MANAGING COMMITTEE - Carl H. Graf, Vice-Chairman

Carbonization Committee

James A. Brown
Chairman

Developments in carbonization methods - all types of apparatus.

Carbonization through coke ovens.

Paper for Convention on carbonization subject.

Progress:

Meeting March 13, 1919.

Each member to report latest improvements in carbonization methods to chairman by May 1.

Sub-committee of 3 operating members to draft report of Committee for Convention and suggest paper.

Meeting of full Committee to consider first draft of report.

Refractory Materials Committee

H. L. Underhill
Chairman

Standard tests and performances of refractories in coal and water gas manufacture.

Cooperation with Bureau of Standards, Refractory Manufacturers Association Committee, and Committee C-8 of American Society for Testing Materials.

Cooperation with Industrial Survey Committee on performance of refractories.

Progress:

Joint meetings have been held with cooperating bodies in development of standard tests.

Meeting of full Committee in early spring to consider program and report at Convention.

Disposal of Waste from Gas Plants

L. J. Willien, Jr.
Chairman

Collection of data on systems of waste disposal from coal, water gas, and coke oven plants.

Cooperation with plants working on specific problems in waste disposal.

Progress:

Meeting of Committee in May to discuss method of carrying on work.

Connection thru membership with typical plants and waste disposal problems.

Chemical Committee

E. C. Uhlig
Chairman

Revision of Gas Chemists' Handbook.

Value of Chemist to Gas Industry.

Chemical Abstracts.

Cooperation with other chemical societies.

Cooperation with other technical committees.

Chemical papers for Fall Convention.

Progress:

Meetings Feb.13, Mar. 3, Apr. 22.

Chapters of Handbook allotted members for revision.

Sub-committees: Abstracting Chemical Journals.

Value of Chemist to Gas Industry.

Chemical paper for Convention.

Cooperation with chemical societies.

Cast Iron Pipe Standards Committee

Walton Forstall
Chairman

Standing Committee to receive suggested changes in existing standards.

Progress:

Modification in standard hat flanges - page 66 A. G. A. MONTHLY.

Cast Iron Pipe Joints Committee

G. I. Vincent
Chairman

Design of standard cement joint for all sizes of cast iron mains.

Progress:

Laboratory experiments to determine strength of bond and shear of cement in joints satisfactorily completed.

Now considering stresses to which mains are subjected and modification of standard bell in larger sizes for design of cement joint.

Electrolysis Committee

J. D. vonMaur
Chairman

General conditions on electrolysis in the U.S. affecting gas companies.

Cooperation with Bureau of Standards and American Committee on Electrolysis to eliminate damage from electrolysis.

Keeping in touch with public service commission rulings on electrolysis.

Remedies.

Progress:

Meeting Mar. 12 1919.

Representatives appointed to American Com. on Electrolysis.

Questionnaire sent to gas companies re damage to joints from electrolysis.

Active touch maintained with Bureau of Standards on Surveys and reports covering electrolysis conditions at Milwaukee, etc.

Consumers Meters Committee

George Wehrle
Chairman

Standards for proof testing and handling meters.

Number of meter sizes and capacity unit.

Lubricant for valves to prevent meters from sticking.

Strained flag arms - cause and remedy.

Training meter repair men.

Straight indexes similar to odometers.

Progress:

Meeting March 12, 1919.

Questionnaire covering above program sent members - data on tests for replies to be submitted by June 1

Meetings to be held during Summer at St. Louis Chicago and Philadelphia.

Papers Committee

A. C. Howard
Chairman

Program of technical papers for Fall Convention.

Progress.

Circular letters to company delegates on April 8 and 21 re authors and subjects.

Meeting of Committee April 30 to consider suggestions received and decide on program.

Publications Committee

W. Cullen Morris
Chairman

Approval of technical contributions to A. G. A. MONTHLY.

H. W. HARTMAN
Secretary, Technical Section

* Committees marked with asterisk are continuing Committees.

Technical Section Organizes New Committees

THE activities of the Technical Section are being carried forward with dispatch and there are good indications that reports of value will be ready for presentation to the Fall Convention.

Two new committees have been organized since the March Conference—in both cases as a result of indications of relative importance brought out at that meeting.

A Committee on the "Disposal of Waste from Gas Plants," headed by Mr. L. J. Willien, Jr., of Charles H. Tenney & Co., will collect data on the various systems for the disposal of waste in coal, water gas and coke oven plants throughout the country, and will make a point of keeping in touch with both committees and individuals working on this subject. The committee will also act as a source of information for companies experiencing any difficulties or contemplating any changes in their present systems of waste disposal and members of the A. G. A. are requested to address their inquiries as well as their suggestions to the Chairman at 201 Devonshire St., Boston, Mass.

A Papers Committee, A. C. Howard, Chairman, will have charge of the responsible task of providing subjects and authors for the Technical Section's share of the program of the Fall Convention. As a preliminary to the first meeting of the committee held on April 30, about 125 letters were sent to managers of gas companies, to secure their views as to subjects to be assigned and individuals best equipped to prepare the addresses. In order to emphasize its conviction that the best papers are a by-product of special interest and careful study or work over an extended period, rather than the special production of a busy man called upon to investigate and report on a particular point, the committee is urging all technical men to assist by sending in the names, and the subjects of their special studies, of gas men who are thus particularly well fitted to present important matters to the Convention. Mr. Howard will be glad to receive all such suggestions at his offices with the United Gas & Electric Engineering Corporation, 61 Broadway, New York City.

A meeting of the Chemical Committee held at Association headquarters on April 22, reported progress in the revision of the Gas Chemists Handbook, and a paper for the Fall Convention was discussed. Abstracts of several articles of interest to the gas industry, which have appeared in recent chemical journals, were submitted by the Sub-Committee on Abstracts, (see page 277, this issue).

The Consumers Meters Committee has divided among its members, the work of conducting tests and gathering data preliminary to the Committee's recommendation of a standard method for proof testing meters, reports to be submitted to the Chairman by June 1. The Committee plans to hold two or three meetings during the summer in different cities to consider local meter practice and problems.

A graphic idea of the organization of the Technical Section can be obtained by consulting the chart of technical committees, drawn up to show the work planned for the year and the progress made by each committee to date. The Managing Committee will appreciate comments or suggestions from all members as to committee work.

Gas and Coke By-Products in the War

HORACE C. PORTER, Chemical Engineer

(Presented at Pennsylvania Gas Association Convention—April 9-11)

Introductoin

IN April, 1917, Col. J. H. Burns (then Capt. Burns) of the U. S. Army, presented at a meeting of your association "The Relation of the Coke and Gas By-Products Industry to the Military Needs of the Nation." He showed that by virtue of the use of toluol, benzol and ammonia, "absolute dependence must be placed on the coke and gas by-products industries as a source of explosives bases." He showed also that we would practically have to double our output of the raw materials for high explosives, to keep pace with the amount of gunpowder or propellant powder which we were then manufacturing and exporting to the Allies, and that accordingly, of toluol or other explosives bases, at least 17,000,000 gallons annually would be required.

It is my purpose now at the invitation of your association to present to you briefly, the accomplishments of the gas and coke industries in the intervening two years of war, justifying in actual performance the dependence which Col. Burns placed upon them.

It will be well perhaps to recall the nature of high explosives as used in this war, the raw materials from which they come and the fact that with the exception of the nitrating acids, the gas by-products industry furnished practically all; then, to outline the requirements of the military programs and the manner in which they were met by the industry fully and promptly under difficult conditions.

Pennsylvania led all the States in production of these essential materials and was the first state to secure toluol commercially for military uses as a by-product of city gas. The Philadelphia Gas Works in 1914 produced toluol from drip and holder oils for disposal to the DuPont Company. The same company began to recover light oil from coal gas in April, 1916. The Pittsburgh By-Product Coke Company, by their operations in Washington, D. C., beginning in June, 1916, and the Philadelphia Gas Works beginning in the same month, were the pioneers in the scrubbing of water gas for toluol. Previous to that time little thought had been given to the possibility of recovering toluol from water gas and it had been commonly considered impracticable.

We of Pennsylvania may well be proud of the prominent part our State took during the early days of the War, in the development of methods to increase toluol production, through the very thorough investigations and comprehensive report of Mr. Wm. H. Gartley of Philadelphia, of the Sub-committee on Coal Tar By-products, of the Council of National Defense. This report opened up a new field in the extension of toluol production and was the foundation on which the Ordnance Department built its structure of actual performance in the recovery of toluol at gas works. We may be proud also of the effective work of production of these raw materials throughout the war, by The United Gas Improvement Company, of Philadelphia, The Barrett Company, of Frankford, The Pittsburgh By-Product Coke Company and the Koppers Company, of Pittsburgh, the Coopers Creek Chemical

Company, of West Conshohocken, and the several by-product coke plant operators in the State, not to mention also valuable experimental work, and the work of refining crude government products, as carried out by all of these companies.

Pennsylvania was in the game from the start and the sum total of her performance, therefore, exceeds materially that of other states which began operations at a later date.

The High Explosives Used

At the time of our entry into the war it was expected that the principal high explosives to be required would be T. N. T. (Tri-nitro-toluol) and picric acid. One of the outstanding developments of the war, however, was the large use of a new shell-filling explosive known as "Amatol,"—developed principally in England and adopted to a large extent in this country. Amatol is a mixture of T. N. T. with ammonium nitrate, the former varying in proportion from 20 per cent. to 60 per cent. The military demand for ammonium nitrate and ammonia was thus expanded beyond all expectations.

Amatol is favored not only for its value as an explosive but partly also on account of its economy as compared to T. N. T. in the use of acids, both nitric and sulphuric, in its manufacture. It was used extensively as a shell-filler by the English and American armies, and to a considerable extent also in trench warfare material.

Picric acid was used in large quantities by the French and *"Explosive D"* or *ammonium picrate* to some extent by the U. S. Navy and by the French. Picric acid was extensively manufactured in this country for export and consumed large quantities of benzol. It is made by the nitration of phenol, which, in turn, is made chiefly from benzol by the synthetic process.

T. N. X. or tri-nitro-xylol, a comparatively new explosive, was developed for the Navy for use in mines and is made from xylol, a principal constituent of solvent naphtha.

Nitro-starch, as well as T. N. T., was used in hand and rifle grenades.

"Tetryl" (tetra-nitro-methyl-aniline), made from benzol, was used in the detonating systems of bombs and shells.

Fulminate of mercury is used in detonators and caps.

Every one of these high explosives, with the exception of nitro-starch and fulminate of mercury, which, by weight, constitute an insignificant proportion of the whole, is derived from toluol, benzol, solvent naphtha or ammonia-gas and coke by-products.

The Raw Materials

Toluol and ammonia were by far the most important of the high explosives bases, from the standpoint of quantities required.

Of toluol there was prospect of a serious shortage when America entered the war. We were then sending to the Allies, toluol and T. N. T. equivalent to 8,000,000 gallons of toluol per year or more than 70 per cent. of the available producing capacity. The balance was hardly sufficient to meet the requirements of the U. S. Navy, alone, and even if the Allies should be cut off, the toluol available would meet scarcely half of the Army's expected requirements at the end of the first year on the basis of amatol averaging 40 per cent. T. N. T.

It was necessary to double the toluol producing capacity within the first year and to provide nitrating capacity to take care of the increase. Capacity for 1,000,000 gallons per month of pure

toluol had to be created within a year. By the combined efforts of the gas and coke companies, the contracting engineers and the Ordnance Department, this was done. Toluol was produced in excess of the available nitrating capacity, shell-loading capacity or shell-making capacity and the production met the military demands.

The sources available were, (a) by-product coke plants, of which practically all of those completed were then recovering toluol and several new plants were under construction; (b) city gas works, of which only about 35 per cent. of the larger plants (making 5,000,000 cubic feet per day) and scarcely any of the smaller ones were already producing toluol, (c) oil cracking processes and certain other special processes awaiting development.

It was necessary to create capacity quickly and to accomplish this the gas works, principally the larger existing water gas plants, offered the best immediate field.

Ammonia, owing to the large and unlooked-for development in the use of ammonium-nitrate, and the necessarily slow construction of the Government's nitrogen fixation projects, threatened to constitute another serious phase of the shortage in raw materials. Gas and coke works are the main source of ammonia, contributing over 90 per cent. of the quantity available. Large increases in by-product coking capacity were under way, at the beginning of the war, which were to add within a year, nearly 50 per cent. to the producing capacity, and it was found practicable also, as a war measure, to reduce considerably the amount of ammonia used for fertilizer, for refrigeration and other ordinary purposes, so that actually, in spite of the very great demand, no serious shortage for military needs developed. Under a system of Government control through the Food Administration and the War Department, the supply was distributed equitably so as to meet all genuinely urgent requirements essential to the war.

The oxidation of ammonia to nitric acid was successfully developed under the auspices of the Bureau of Mines and the nitrate division of the Ordnance Department, so that by-product ammonia from coal was being converted efficiently on a small manufacturing scale before the war ended. The Semet-Solvay Company, of Syracuse, New York, cooperated very effectively in this work.

If the war had continued, this use of ammonia would probably have been increased so as to lighten the burden of securing additional nitrate from Chile for an enlarged explosives program.

It was not found necessary before November, 1918 to utilize in any important degree the synthetic and other processes for obtaining so-called "air nitrates." The Government nitrogen fixation plants in Alabama began production on a small scale shortly before the signing of the Armistice, using steam power generated from coal; but the construction of the Muscle Shoals hydro-electric project designed for the use of the fixation plants was, early in 1918, postponed until after the war. The fixation plants also have now discontinued operations.

It is pertinent here, perhaps, to mention particularly the Government plant at Perryville, Md., for the manufacture of ammonium nitrate using a process of direct inter-reaction between ammonium sulfate and Chile saltpeter. This plant reached a production of nearly 350,000 pounds per day before the war ended, and had not yet attained its full capacity. Ground was broken in March, 1918, and

production began in July. The remarkable character of this achievement can be realized when it is noted that the plant at full capacity would handle 600 tons of raw materials per day and operate a new and difficult process requiring most careful scientific control.

Benzol was produced in this country during the war in ample quantities, to meet the requirements for manufacture of picric acid and ammonium picrate for military purposes and at the same time meet fully the demands of the rapidly expanding American dye industry.

In the crude light oil scrubbed from coke oven gas, benzol accompanies toluol in a ratio of about 4 to 1 and in water gas somewhat less than 2 to 1, so that there has been available at all times on an average, about three times as much benzol as toluol, the demand for it being less than that for toluol. Large quantities have been shipped to France and still larger quantities have been converted to phenol and picric acid in this country.

Xylol for the manufacture of T. N. X. is obtained from a special refined solvent naphtha, the fraction of light oil distilling between 137° and 160° C. Approximately 65 per cent. can be recovered from this grade of solvent as meta-xylol suitable for nitration. The requirements of the Navy Department for this material were met (but not greatly exceeded) by the production of solvent naphtha at coke and gas works. The heavier grade of solvent and a small amount of the light material also was utilized in cracking processes, to obtain additional toluol.

The materials named above were the principal bases used in the manufacture of high explosives for the war, but there were also required for the conversion of these into finished explosives, large quantities of sulphuric and nitric acids and, in the case of phenol manufacture, caustic soda, also. The supply and distribution of these latter materials were under control of the Government and military needs were well taken care of, although very careful supervision was required in order to satisfy the genuinely essential needs of the chemical industries, especially in caustic soda.

Increasing Toluol Production

Toluol, as has been said, among all the raw materials, required most attention, in order to bring capacity up to a level with requirements.

The gas works were not in most cases recovering toluol, although the gas which they made contained it, and there was required for its recovery only the addition of scrubbing and purifying apparatus. The coke ovens, on the other hand, were recovering all their toluol and this source could only be increased by building more ovens, necessitating at least a year's delay. The large gas works, where the greatest returns from a given investment could be obtained, with only 4 or 5 months delay for plant construction, thus offered the most promising source of increase.

The Council of National Defense, Committee on Chemicals, and Sub-committee on Coal Tar By-Products, through a second sub-committee on Recovery of Toluol at Gas Works, of which Wm. H. Gartley was Chairman, took the matter in hand about July 1, 1917, and submitted soon thereafter the valuable report to which we have referred above, thoroughly covering the situation. The Sub-committee on Coal Tar By-Products was constituted as follows:

Wm. H. Childs, The Barrett Co., New York, Chairman
John A. Topping, Republic Iron & Steel Co.
H. H. S. Handy, Semet-Solvay Co.
W. R. Addicks, Consolidated Gas Co. of New York

TABLE 1.—ARMY ORDNANCE TOLUOL RECOVERY PLANTS AT CITY GAS WORKS, 1918

Location of plant	Rated production of pure toluol (gals. per mo.)	Actual production of pure toluol per mo. (Note a)	Date of starting	Date of closing
1. New York—Astoria Works (W)			Aug. 6	Nov. 22
1. New York—Astoria Works (C)	48,000	58,000	Sept. 7	Nov. 22
2. New York—21st St. Works	35,000	45,900 (c)	April 14	Nov. 23
3. New York—Ravenswood Works	27,000	35,000	June 11	Nov. 28
4. New York—Mutual Works	18,000	21,700	June 2	Nov. 22
5. New York—Standard Works	12,000	19,500 (c)	May 8	Nov. 23
6. New York—Central Union Works	22,800	20,200	May 22	Nov. 22
7. New York—Pelham Works	8,500	9,000 (c)	May 8	Nov. 22
8. Brooklyn—Fulton Works	11,000	15,400	July 8	Nov. 22
9. Brooklyn—Citizens Works	15,000	15,200	July 11	Nov. 22
10. Brooklyn—Nassau Works	22,300	26,000	Nov. 4	Nov. 21
11. Brooklyn—Metropolitan Works	14,000	26,400	Aug. 10	Nov. 22
12. Brooklyn—Williamsburg Works	31,000	21,000	Oct. 8	Nov. 21
13. Providence, R. I.	14,600	13,200	July 24	Nov. 21
14. Everett, Mass. (Boston)	17,500	17,500	Nov. 5	Nov. 19
15. Minneapolis, Minn.	11,000	7,700	May 8	Nov. 22
16. Detroit, Mich. Station A	17,000	7,900	June 21	Nov. 20
17. Detroit, Mich. Station B	13,000	4,800	July 2	Nov. 21
18. Joliet, Ill.	6,700	5,100	April 30	Nov. 18
19. St. Louis, Mo. (Note b)	13,000		May	
20. Malden, Mass. (Note b)	3,000		July	
21. Worcester, Mass. (Note b)	3,000		July	
22. Elizabeth, N. J.	6,300		Oct. 31	Nov. 18
23. Washington, D. C. (East Sta.)	8,300		Sept. 25	Oct. 31
24. Bridgeport, Conn.	6,700	Operation not started		
25. New Haven, Conn.	6,600	Operation not started		
26. Albany, N. Y.	4,000	Operation not started		
27. Utica, N. Y.	3,200	Operation not started		
28. Denver, Colo.	6,000	Operation not started		
29. Seattle, Wash.	6,700	Operation not started		
30. New Orleans, La.	7,200	Operation not started		
31. New York, Kings County Works	7,700	Operation not started		
Total (Plants 1 to 18)	344,400	369,500		

Note a: Average monthly output over entire period, estimating practical yield of pure toluol from crude.

Note b: Privately owned plant—negotiated by Ordnance Department.

Note c: About 10 per cent. of this production from outside oils.

W. H. Gartley, The United Gas Improvement Co., Philadelphia, Pa.

Wm. E. McKay, Boston, Mass.

C. J. Ramsburg, The Koppers Co., Pittsburgh, Pa.

W. A. Bradford, Butterworth Judson Corp., New York, N. Y.

H. H. Dow, Dow Chemical Co., Midland, Mich.

D. W. Jayne, The Barrett Co., New York, N. Y., Secretary.

About October 1, 1917, the Ordnance Department of the Army, through the Gun Division, Explosives Section, began the development of plans for creating more toluol capacity and entered into negotiations with the gas companies and contractors for the installation of toluol recovery plants.

The Sub-committee of the Council of National Defense had reported that there was possible, at gas works larger than 500,000 cubic feet in daily capacity, an additional recovery of about 7,000,000 gallons pure toluol per year. Decision was then reached by the Ordnance Department in co-operation with the gas companies to build at once a producing capacity of about 4,500,000 gallons toluol at 18 of the larger gas plants. A few months later a second group comprising 10 more plants of somewhat smaller

capacity was contracted for by the Ordnance Department.

The new plants negotiated by the Ordnance Department and, with two or three exceptions as noted, built and owned by the Government, were as listed in Table 1.

It will be noted that the total actual production of this first group of ordnance plants during the entire period operated was almost exactly at the rate of 4,500,000 gallons per year, but at the end of the period they were operating at a considerably higher rate, probably 20 per cent. greater. The second group of smaller plants was practically ready for operation when the Armistice was signed.

At the gas works in all of the larger cities there were privately owned toluol plants already in operation or nearly completed, of which the following is a summary:

TABLE 2.—TOLUOL RECOVERY PLANTS AT GAS WORKS, PRIVATELY OWNED AND OPERATED

Location	Operating Company	Approximate date of starting	Rated annual production Pure Toluol (In crude)
Washington, D. C. (West Station)	Pittsburgh By-Product Coke Co. (Pittsburgh, Pa.)	June, 1916	100,000
Philadelphia, Pa.	The United Gas Improvement Co.	June, 1916	
Des Moines, Ia.	The United Gas Improvement Co.	Early 1917	1,000,000
Syracuse, N. Y.	The United Gas Improvement Co.	Early 1917	
Newark, N. J.	Pittsburgh By-Product Coke Co.	Feb., 1917	300,000
Paterson, N. J.	Pittsburgh By-Product Coke Co.	Aug., 1917	150,000
Trenton, N. J.	Pittsburgh By-Product Coke Co.	Oct., 1917	120,000
Jersey City, N. J.	Pittsburgh By-Product Coke Co.	Nov., 1917	300,000
Rochester, N. Y.	Pittsburgh By-Product Coke Co.	June, 1917	120,000
Chicago, Division St.	Peoples Gas Light & Coke Co.	Feb., 1917	220,000
Chicago, 22nd St.	Peoples Gas Light & Coke Co.	Mar., 1917	230,000
Chicago, North Station	Peoples Gas Light & Coke Co.	Feb., 1918	250,000
Chicago, South Station	Peoples Gas Light & Coke Co.	Mar., 1918	300,000
Evanston, Ill. (Niles Station)	Public Service Co. of No. Illinois	Late 1917	100,000
	Total		3,190,000

The Ordnance Department let contracts for the first group of plants early in December, 1917, and organized a branch, known as the Toluol Unit, with headquarters in New York, for directing their construction. The Ordnance Toluol Unit with the efficient co-operation of the gas companies and contractors, completed these plants in remarkable time during the exceptionally severe winter and under the existing difficult conditions of supply and transportation of materials which are still vividly recollected. The first plant was put into operation on April 14, 1918. The investment in these ordnance gas stripping plants totaled nearly $8,000,000; thus it may be seen that the job was no small one.

It is hardly of sufficient interest now in view of the many published articles on the subject to describe here in detail the method of recovering light oil and toluol from gas. The Government plants used the methods prevailing in private plants with some variation in detail but with essential principles the same. The gas was completely scrubbed and the light oil thus recovered was fractionated, a part being returned to the gas. In other words, the gas was cleaned and then re-enriched. The ordnance plants did not wash and refine to ultimate purity, the crude toluol obtained from the light oil, this being delegated to existing private refineries which had surplus capacity. The crude fractionating stills at the gas plants did, however, produce a remarkably high grade of material, containing in some cases as high as 91 per cent. pure toluol.

Some results of the operations and a few of the "high spots" on the technical side will, perhaps, prove of interest.

The actual yield per 1,000 cubic feet for the entire period, including the first days of operation, when results were below normal, averaged 0.0751 gallon pure refined toluol from water gas and 0.0693 gallon as a general average from all gas scrubbed, both water gas and coal gas. This yield per one thousand was 20-25 per cent. greater than had been expected. The yield of pure toluol per gallon of gas oil averaged 1.904 per cent.

The circulation of wash oil amounted, on an average, to 10 gallons per 1,000 cubic feet or 25½ gallons per gallon of light oil recovered. In other words the difference between benzolized and debenzolized wash oil averaged about 4 per cent light oil.

Re-enrichment of the gas with benzol (including fore-runnings) was practised in all plants. Careful measurement at one plant over an extended period showed an enriching value in this benzol of 26.9 candles and 115.9 B. t. u. per gallon per 1,000 cubic feet.

No complaints of gas quality were re-

TABLE 3.—TOLUOL RECOVERY AT CITY GAS WORKS, ARMY ORDNANCE PLANTS, 1918

Average results over entire period of operation varying from 2 weeks to 7½ months

Plant	Kind of gas scrubbed	Gas oil used per M (Gallons)	Light oil recovered per M (Gallons) (Note 1)	Per cent. of gas oil recovered as light oil	Average daily quantity of gas scrubbed (M cubic ft.)	Total crude toluol produced Entire period (Note 2)	Per cent recovery of crude toluol from light oil	Per cent. recovery of crude toluol from gas oil
No. 1	Water	3.92	0.38	9.7	15563	(a) 449,375	26.3	2.55
" 2	(b) Coke oven		0.21		9349	45,488	12.0	
" 3	Water	3.72	0.36	9.7	6622	(a) 171,411	26.1	2.53
" 4	"	3.33	0.37	11.1	3681	(a) 78,534	22 3	2.47
" 5	Coal and water	3.01	0.37	12.3	8500	(c) 221,911	(c) 40.8	
" 6	Water	4.30	0.43	10.0	6686	163,054	29.2	2.92
" 7	"	4.18	0.43	10.3	7622	165,436	27.8	2.86
" 8	"	4.06	0.37	9.1	14657	260,741	28.4	2.58
" 9	Coal and water		0.22		6761	52,940	19.1	
" 10	" " "		0.32		5395	29,888	18.5	
" 11	Water	4.14	0.43	10.4	6494	93,459	25.0	2.60
" 12	"	4.03	0.46	11.4	5868	88,472	25.5	2.91
" 13	Coal and water		0.37		6182	69,355	27.6	
" 14	Water	4.60	0.41	8.9	17021	(e) 262,476	(e) 26.2	2.33
" 15	"	4.02	0.37	9.2	12361	119.722	25.6	2.36
" 16	Coal		0.39	(d)	7592	(e)	(e)	
" 17	Water	3.85	0 25	6.5	3891	4,320	20.6	1.34
" 18	"	3.83	0.26	6.8	14509	39,829	19.8	1.35
" 19	"	4.10	0.43	10.5	3343	(f) 18,633		
" 20	"	3.94	0.41	10.4	11290	20,425	31 1	3.24
" 21	"	3.18	0.33	10.4	12156	11,812	31.2	3.25
Av. (wgh'td) New York City		3.99	0.39	9.95	9540	1,912,940	26.1	2.59
Av. (wgh'td) Wat. gas plants		3.98	0.39	9.89	9390		26.1	2.58
Av. (wgh'td) All plants		3.89	0.36	9.89	8800	2,367,227		2.58

Note 1: Light oil of grades distilling completely under 200° C.

Note 2: With the exception of Plants 5 and 19, the crude toluol produced contained about 80-90 per cent. toluol. At plants 5 and 19 the product was of lower grade, the plants having been so designed.

(a) Includes small quantity from outside oils (holder and drip oils).

(b) This coke oven gas was in lean and rich portions treated in separate scrubbers, about 55 per cent. lean and 45 per cent. rich.

(c) This is a low grade crude toluol containing only about 25 per cent. toluol.

(d) Yield from coal carbonized, 4.3 gallons per ton.

(e) Plants 14 and 16 combined.

(f) Crude light oil, containing 19 per cent. toluol.

ceived from consumers. An advantage is to be found in delivering clean gas from which the condensable materials, particularly naphthalene and the heavier olefine oils, tending to build up stoppages in appliances have been removed.

No trouble was experienced in securing pure toluol containing less than 0.2 per cent. paraffins. An important factor in this result lay in the operation of the water gas carbureter under proper conditions of temperature and rate of oil feed.

Drip and holder oils were purchased by the Ordnance Department and refined at the rate of possibly 40,000 to 50,000 gallons per month. Throughout the country, at least 250,000 gallons per month of these oils yielding 25,000 to 30,000 gallons pure toluol, were worked up during the war, in spite of the fact that the light oil recovery plants reduced the quantity of drip obtainable.

The use of small simplified light oil recovery plants for partial scrubbing of the gas with tar at small gas works, was not adopted to any considerable extent in this country as it was in England. If the war had continued, these small light oil plants, would probably have been adopted more generally but up to the signing of the Armistice the toluol requirements were met, at less expense, by the larger installations.

The same comments apply to the distillation of water gas tar for toluol. The matter was carefully investigated and it was found that the possible yield was so small as not to justify the expense of recovery as long as other cheaper sources were available to meet requirements.

The cracking of solvent naphtha to produce toluol was, however, practised in important measure. Experiments carried out in water gas sets by The United Gas Improvement Company, Philadelphia; The Peoples Gas Co., Chicago, and the Pittsburgh By-Product Coke Co., at Rochester, N. Y., at the instance of the Ordnance Department, showed that this method was practicable and would yield 9 to 12 per cent. toluol from the solvent naphtha. Other methods of cracking were developed which yielded greater returns in toluol and, therefore, the water gas process was not used beyond the experimental stage.

The Hall cracking process, developed by trials made by the Ordnance Department co-operating with the Texas Company, at their Bayonne, N. J., plant was successfully operated for four months on about 100,000 gallons of solvent naphtha per month, yielding 20 per cent. pure toluol. The crude cracked oils were fractionated at the plant and a portion returned for recracking, the light benzol-toluol fraction being shipped to refineries. The solvent used for cracking was obtained from the crude stills in the New York gas stripping plants. The yield of toluol from the gas was thereby increased by about 20 per cent. and, with this additional recovery from solvent, totaled about 0.10 gallon per one thousand of gas.

The Rittman process also proved practicable for cracking solvent naphtha and was carefully tested by the Ordnance Department. It gave a yield of approximately 20 per cent. pure toluol. A contract was executed by the Ordnance Department in October, 1918, with the Synthetic Hydrocarbon Co., of Pittsburgh, to crack 1,000,000 gallons of solvent per year by this process but production had not yet begun when the war ended.

Owing to the demands for solvent naphtha for making xylol and T. N. X., and to the greater yield in high explosives thus obtainable, the cracking of solvent

to make toluol was limited to the comparatively small balance of the country's output not required for this use by the Navy. It is likely, however, that at least 5,000,000 gallons of solvent per year would have been available for cracking with a yield of toluol therefrom amounting to 1,000,000 gallons.

An important source of toluol, which need not be described here since it lies outside of gas works practice, was the cracking of petroleum distillate in California. A process was developed by the Ordnance Department with the co-operation of the General Petroleum Corporation, of Los Angeles, whereby 6.0 per cent. and possibly more of the raw material was obtained as pure toluol. A large plant was built at Los Angeles which operated successfully for three months, and another was well under way at San Francisco. Great credit for the successful development of this process belongs to the Philadelphia gas engineers, S. J. Dickey and W. H. Fulweiler of The United Gas Improvement Company, who were engaged thereon as consulting experts for the Ordnance Department.

Trials were made of several other proposed new sources of toluol, but none gave sufficient promise to warrant its development at Government expense while cheaper processes were still available in gas-stripping and oil cracking. As one instance, there may be mentioned the turpentine obtained at paper mills by the sulphite digestion of spruce pulp. Between 500,000 and 1,000,000 gallons of this turpentine would have been available per year at low cost and it consisted of about 90 per cent. cymene, a hydrocarbon closely related to toluol. The processes which seemed to be available for conversion of this material into toluol showed, on trial, rather low yields, and were impracticable until further experimental work could be done on them.

The summary in Table 4 shows at a glance how the toluol problem was met and conquered. Gas works, it will be seen, were the main factor, in the actual increase of capacity. Out of a total increase of 108.5 per cent. actually created, they provided 60 per cent. The remainder came chiefly from coke ovens.

For this accomplishment, the gas and coke industry deserves most hearty commendation from the Government. Its

TABLE 4.—Development of Toluol Producing Capacity Since October 1, 1917.

Source	Gallons per month	Per cent. Increase
Existing Capacity, October 1, 1917:		
Gas works	260,000	
Coke works and miscellaneous	740,000	
Total	1,000,000	
Private Plants, placed in operation Oct., 1917, to Nov., 1918:		
By-product coke oven plants	360,000	36.0
Gas stripping plants	100,000	10.0
Government Plants:		
Gas stripping plants, 1st group	425,000	42.5
Gas stripping plants, 2nd group	75,000	7.5
Oil cracking plants	125,000	12.5
Total completed before Dec. 1, 1918	2,085,000	108.5
Private coke plants under construction Dec. 1, 1918	77,000	7.7
Government oil cracking plants under construction Dec. 1, 1918	300,000	30.0
Government-aided by-product coke plants under construction Dec. 1, 1918	323,000	32.3
Total built and building Dec. 1, 1918	2,785,000	178.5

opportunity for service in the war was grasped promptly and effectively, it produced what was asked and more. The spirit of co-operation and the interested effort shown by officers and employees of the gas companies in toluol recovery at their plants was chiefly responsible for the success attained. The employees of the Consolidated Gas Company of New York and Vice-President W. R. Addicks of that company, who gave much of his time and attention personally to these matters, are especially to be commended for their part in bringing to a successful issue the Government's gas-stripping operations.

Heat Economies at Rochester, N. Y.

W. H. EARLE

THE purpose of this paper is to present, for what it may be worth, a general heat balance for the Rochester coal gas plant, based not on test conditions, but on general operating conditions as shown by an average month's manufacturing report.

The carbonizing unit consists of three batteries of The United Gas Improvement Company's intermittent verticals, there being seven benches of nines per battery. The retorts are of silica, except for top and bottom clay sections, 22 feet 5 inches deep, 10 by 22 inches in cross section at the top and 18 by 30 inches at the bottom.

The novelty of the plant is its heating unit, consisting of five specially designed United Gas Improvement Company producers classified as 8 foot 6 inch, high pressure producers. These are housed in a building adjacent to the retort house. Three are in operation and two are in reserve at all times.

Each producer is made up of three sections, *viz.*, the magazine, the generator, and the base which houses the driving mechanisms, ash receiver, etc. The machine stands 19 feet ½ inch high, exclusive of bottom clean out and charging hopper.

The magazine is 6 feet 3 inches deep and 11 feet 5 inches outside diameter, lined with graduated brick sloping downward toward the center. Within the magazine is the gas off-take.

The generator is 9 feet deep, 8 feet 6 inches inside diameter, with a 6-inch water jacket, and no brick lining. The grate is conical, 6 feet 6 inches in diameter at the base, 3 feet 6 inches high, tapering to a round perforated nose casting and it is set eccentric to the center line of the producer. It is perforated throughout for distribution of the steam and primary air. The grate area is approximately 50 square feet.

The grate is mounted on a toothed casting, which meshes with a worm at the back of the producer. This is actuated by a clutch device, driven by an eccentric from a master motor and counter shaft, for all producers. The base also encloses a steel ash plow, which throws the ashes into a hopper from which they are periodically conveyed to the dump.

Primary air is supplied to the base of the producer by a turbine driven fan. A similar unit supplies secondary air to the benches, and the exhaust from these two turbines supplies the steam for producer operation.

The gas is carried from the individual producers into a collecting header, through a cyclone dust arrester, into a distributing header extending the length

of the retort settings, provided with suitable off-takes into each bench. The gas lines are steel, heavily lined internally to prevent loss of sensible heat.

The entire producer house operation is conducted by an operator and helper on each shift. These men are of the caliber of high grade water gas operators. Operation is continuous and largely automatic. Fuel is stored in overhead steel bunkers. A traveling hopper with recording scale, is used to load the charging hoppers on the conveyors. These hoppers are mounted on a water sealed deck above the magazine, which is rotated by hand, distributing the fuel charge into the magazine. Air and steam are measured by Venturi meters. The ash and clinkers are continuously crushed by the eccentric movement of the grate, and plowed out.

The advantages of the system over the usual individual bench producers seem obvious.

1—Use of a very low grade of fuel—in our case, fine coke and breeze.
2—No fires to clean.
3—Uniform quality of gas supplied to each bench.
4—Three fire conditions to maintain instead of twenty-one.
5—Minimum labor requirement.

The plant is also equipped with three United Gas Improvement Company waste heat boilers, operating on the waste gases from the recuperators, and supplied with water partially preheated by circulating through the producer shells, and partially by a feed water heater.

The following data are taken from the manufacturing report for January, 1919:

Total coal carbonized (dry)		13,102 short tons
Total producer fuel used (wet)		2,355 short tons
Per cent. moisture		10
Total producer fuel used (dry)		2,120 short tons
Average fuel analysis:		
Volatile matter	8.0 per cent.	
Fixed carbon	72.6 per cent.	
Ash	19.4 per cent.	
B. t. u. per pound	11,900	

Producers:

Fuel per day—tons		68.38
Fuel per day—B. t. u.		1,627,610,600
Steam per day—pounds		73,440
Steam input—B. t. u.		85,116,960
Primary air input—cubic feet		6,912,000
Primary air input—pounds		529,459
Air inlet temperature—degrees F.		50
Input—above 32° F.—B. t. u.		2,541,408
Producer gas made—cubic feet		10,113,120
Producer gas made—pounds		673,534
Analysis:		
CO_2	6.4	
CO	26.7	
H_2	13.0	
N_2	53.9	
B. t. u.	128.5	
Value—B. t. u.		1,299,535,920
Outlet gas temperature—degrees F.		1,050
Sensible heat in gas—above 32° F.—B. t. u.		164,558,824
Circulating water inlet temperature—degrees F.		70
Circulating water outlet temperature—degrees F.		150
Water circulated estimate—pounds		500,000
B. t. u. recovered in water		40,000,000
Total input—B. t. u.		1,715,268,968
Output in gas—B. t. u.		1,464,094,744

Output in water—B. t. u.	40,000,000
Total output—B. t. u.	1,504,094,744
Lost or consumed in producer operation—B. t. u.	211,174,224
Recovery = 88 per cent.	

Producers to Combustion Chambers:

Producer gas—pounds	673,534
Total heat—B. t. u.	1,464,094,744
Outlet producer temperature—degrees F.	1,050
Inlet benches—degrees F.	1,020
Loss—degrees F.	30
Loss—B. t. u.	4,849,440
Loss—3 per cent.	
Heat delivered to benches—B. t. u.	1,459,245,304

Benches—Combustion Chamber:

Producer gas input—B. t. u.	1,459,245,304
Secondary air input—cubic feet	10,000,000
Secondary air input—pounds	770,000
Temperature secondary air—degrees F.	1,500
Sensible heat—above 32° F.—B. t. u.	271,286,400
Total heat input at combustion chamber—B. t. u.	1,730,531,704
Temperature inlet producer gas—degrees F.	1,020
Temperature inlet secondary air—degrees F.	1,500
Temperature combustion chamber—degrees F.	2,750
Heat of combustion consumed in heating air and gas to combustion chamber temperature:	
Air—B. t. u.	231,000,000
Gas—B. t. u.	281,451,312
Hereafter appearing as sensible heat—B. t. u.	512,451,312

Products of Combustion:

75,079	pounds CO_2	
309,009	pounds CO_2	from CO
62,712	pounds H_2O	from H
406,365	pounds N	in gas
592,900	pounds N	in secondary air
1,446,065	pounds Total	

CO_2	384,088	= 26.5 per cent.
H_2O	62,712	= 4.4 per cent.
N	999,265	= 69.1 per cent.

Specific heat at 0.24 per cent.	
Products of combustion—pounds	1,446,065
Temperature—combustion chamber—degrees F.	2,750
Temperature—inlet recuperators—degrees F.	1,500
Temperature—loss—degrees F.	1,250
Used in carbonization—B. t. u.	433,819,488

Recuperation:

Secondary air inlet temperature—degrees F.	50
Secondary air outlet temperature—degrees F.	1,500
Gain—degrees F.	1,450
Used in recuperation—B. t. u.	267,960,000

Boilers:

Steam made—pounds per day	252,000
Inlet water—degrees F.	140
Steam pressure—pound gauge—degrees F.	120
Steam—B. t. u.	275,184,000
Temperature outlet boiler—degrees F.	400
Loss in chimney gas to 32° F.—B. t. u.	127,716,456

RESUME.

Heat input at producers—B. t. u.		1,715,268,968
1—Loss in producers	211,174,224	
2—Loss in unused circulated H_2O	19,840,000	
3—Loss in distributing flue	4,849,440	

4—Used in settings	433,819,488	
5—Used in recuperation	267,960,000	
6—Used in steam generation	275,184,000	
7—Loss in chimney	127,716,456	
Total accounted for—B. t. u.		1,340,543,608
Unaccounted for, radiation, etc.—B. t. u.		374,725,360

Distribution per Pound of Coal:

B. t. u. input			2,030
Producer losses	250	= 12.30 per cent.	
Loss in unused water	23	= 1.13	
Used in settings	513	= 25.28	
Recuperation	317	= 15.61	
Steam generation	325	= 16.00	
Chimney loss	151	= 7.45	
Total accounted for	1,579	= 77.78	
Total unaccounted for	451	= 22.21	
B. t. u. consumed in work		56.89	
Lost or unaccounted for		43.11	

Drip Pumping by Motor Wagon in Philadelphia

WALTON FORSTALL

THE Philadelphia Gas Works has 30 miles of pumping mains, conveying gas from the two manufacturing stations to the seven outlying holder stations, and 1,586 miles of distribution mains. Prior to 1912, the entire condensation from these mains was pumped by hand into tanks drawn by horses, the work on the pumping mains being looked after by two wagons, one operating from each manufacturing station and both being on the street every working day. The five distribution districts each employed a horse-drawn tank wagon for the condensation within its territory. These wagons were not busy every day.

In the fall of 1912, as a result of some experiments made the previous winter, a 3½-ton electric wagon, equipped with a motor-driven pump, began operations. During the year 1913, it pumped 608,000 gallons, at a cost of 0.58 cent a gallon. This compared with a cost of 1.16 cents for the 157,000 gallons pumped by a horse-drawn wagon. In 1915, the electric wagon pumped 606,000 gallons, at a cost of 0.59 cent, and the horse-drawn wagon 211,000 gallons, at a cost of 1.3 cents. By that time the success of the power pumping was so decided, its economy over a horse-drawn wagon so pronounced, and the temptation to work the electric wagon long hours in order to effect economy so strong, that it was decided an additional motor wagon should be purchased, even though it was expected that with two motor drip wagons, both could not always be operated with the highest economy. After careful consideration, it was decided that the second wagon should be of 5-ton capacity, and that gasoline should be the motive power rather than electricity. For the year 1918, the record of these two wagons is as follows:

	Gallons pumped	Cost per gallon
Gasoline wagon	711,000	0.79 cent
Electric wagon	351,000	1.05 cents

This record speaks for itself, if we bear in mind that as long ago as 1915 a

horse-drawn wagon cost 1.3 cents per gallon. The costs as shown include all operating expenses and depreciation, and, in addition, interest on the motor wagon investment. The cost of the electric wagon would have been lower had it not been assigned the job of pumping whatever condensation could not be cared for by the gasoline wagon. It is interesting to know that both of these wagons are operated for fully three-fourths of the time by one man, a second man only being used during winter weather or at times to break in a new employee, for, it pays at all times to have at least four men familiar with the route of the drip wagons.

These two wagons took care of all the drip pumping work in Philadelphia in 1918, except 12,000 gallons removed by a horse-wagon,—probably representing a number of isolated cases of emergency work. This horse wagon work cost 8¼ cents a gallon. The total cost for approximately 1,075,000 gallons pumped in 1918 was, in round figures, $10,300.

RECENT ARTICLES IN CHEMICAL PRESS OF INTEREST TO GAS MEN

Contributed by Sub-Committee on Abstracts* of the Chemical Committee

* Abstractors' names appear in brackets following each item.

How the Nitrogen Problem has been Solved. By Henry J. M. Creighton, *Journal Franklin Institute*, 187, 377 (April, 1919). A detailed account of the various nitrogen fixation processes. (H. C. Porter.)

A Precision Pressure Gauge. By Edw. J. Brady (Physical Laboratory, United Gas Improvement Co.), *Journal Franklin Institute*, 187, 499 (April, 1919). A large diameter U-tube (2.4 inches diameter) filled with kerosene is made of vertical glass cylinders attached to a brass box as a base. Hollow brass floats on the surface of the kerosene are connected by a fine silk thread passing down through the oil around a pivoted brass index drum immersed in the oil. By means of a Vernier, a small mirror and a telescope mounted with scale at 4 feet distance, the motion of the index drum can be read through a window with such precision that a pressure difference of less than 1/1000 inch of water is measurable. The gauge is particularly useful with the Venturi meter or Pitot tube at low velocities when very slight pressure differences have large effect on the velocity determination. (H. C. Porter.)

A Specific Gravity Apparatus for Gases. By E. J. Brady (Physical Laboratory, United Gas Improvement Co.), *Journal Franklin Institute*, 187, 501 (April, 1919). The U-tube precision pressure gauge devised by the author (this *Journal*, 187, 499) is utilized to determine specific gravity of a gas. A tall vertical tube is attached to one arm of the gauge through a four-way cock by which the tube is filled with the gas to be tested. On turning the cock so as to connect the vertical tube of gas with one arm of the gauge, a slight suction or pressure appears which it is possible to measure with precision by this form of gauge. The scale may be graduated to read in specific gravity direct. (H. C. Porter.)

Analysis of Natural Gas—Calculations and Application of Results. By R. P. Anderson, *Journal of Industrial and Engineering Chemistry*, Vol. 2, p. 299 (April, 1919). Description of apparatus, methods and tables for analysis of natural gas and application of results for calculation, specific gravity and heating value. (E. J. Murphy.)

Sodium Pyrogallate Solution as an Absorbent for Oxygen. By G. W. Jones and M. H. Meighan, *Journal of Industrial and Engineering Chemistry*, 311 (April, 1919). An historical and experimental paper giving description of apparatus used, with tables and conclusions. (E. J. Murphy.)

Great Perseverance Shown in Earning Gas Diplomas

WHEN the National Commercial Gas Association in 1914 determined to conduct a series of three year gas educational courses, there was little thought of the big events that awaited both our country and the individuals that constitute it; there was no reckoning of the difficulties that a world war would place in the path of this Association in its attempts to carry through its plans, or in the way of individual students determined to gain every advantage which opportunity offered them.

In spite of the war, draft, epidemic and increased costs, however, the N. C. G. A. handed on to the American Gas Association its gigantic task well-nigh finished, and in December of 1918 the record stood complete. The Association has supervised, edited and published a total of one hundred and thirty pamphlets containing authentic information on certain general topics closely allied to the course of study in gas, and covering various phases of the gas industry from the viewpoint of the technical man, the salesman, the specialist and the manager.

It is our purpose, however, to speak of the men who enrolled in the Association's courses and who, in spite of the interruptions of army or navy service or the extra burden put on those who remained when the gas company's forces were depleted at the time the nation called, finished their studies creditably and have now been awarded the Association's diploma, signed by Dr. Lee Galloway, Director of the Courses; Mr. Louis Stotz, Assistant Secretary Manager, and Mr. George B. Cortelyou, President of the American Gas Association.

The list which we print here is indeed an honor roll and one well worth the attention of gas company executives. It can safely be contended that the man who has studied for three years, and answered during that time a series of twenty-four tests has shown a perseverance and an interest in his work that are bound to be of value to both himself and his employer.

It is with great pleasure that the Association announces the award of diplomas to the following men up to May 10, 1919:

Arthur B. Spaulding, Jersey City, N. J.	Commercial Management
Clement E. Goldsmith, Brooklyn, N. Y.	Industrial Fuel
Alden Wilmot, New York, N. Y.	Accounting
Roy G. Munroe, Denver, Colo.	Industrial Fuel
Charles C. Krausse, Baltimore, Md.	Industrial Fuel
F. P. Fitchner, Manchester, Conn.	Salesmanship
John Percy Conklin, Brooklyn, N. Y.	Commercial Management
Robert R. Barr, Baltimore, Md.	Industrial Fuel
Alvin G. Koehler, Woodhaven, N. Y.	Commercial Management and Salesmanship
Henry N. Baker, Mt. Vernon, N. Y.	Industrial Fuel
Carl C. S. Walter, Baltimore, Md.	Industrial Fuel
Albert Braun, Woodhaven, N. Y.	Industrial Fuel
Benjamin A. Duvall, Baltimore, Md.	Salesmanship
John F. Berg, Newark, N. J.	Accounting
Frank B. Shay, Newburgh, N. Y.	Industrial Fuel
Thomas Anderson, Long Island City, N. Y.	Industrial Fuel

Eugene D. Milener, Jr., Baltimore, Md.....Industrial Fuel
Wm. A. Conway, Wilmington, Del.....Salesmanship
Thomas Cunningham, Jr., Newburgh, N. Y...Industrial Fuel
Louis E. Ragan, Rome, N. Y.....Salesmanship
David B. Benedict, Hoboken, N. J.....Salesmanship
J. H. Y. Kidd, Newburgh, N. Y.....Commercial Management and Industrial Fuel
George Howard Smith, Newburgh, N. Y.....Industrial Fuel
Frank W. Vredenburgh, Newburgh, N. Y.....Commercial Management and Industrial Fuel
Raymond Jenkinson, Newburgh, N. Y.....Salesmanship
Frank J. Winder, Schenectady, N. Y.....Industrial Fuel
Walter H. Doyle, Newburgh, N. Y.....Commercial Management and Industrial Fuel
W. H. Huling, Newburgh, N. Y.....Industrial Fuel

The Gas Company Library

for ambitious employees as well as for department heads, should specialize on authoritative books written for gas men, by gas men, about the aspects of their own business.

The Association offers now, in a set of 8 bound volumes, the 100 booklets prepared for its Practical Gas Educational Courses and formerly available only to students, at a cost of $125.00 for five courses.

Complete set includes Industrial Fuel, Salesmanship, Illumination, Commercial Management, Accounting, Business English, Introductory Lessons and Reference Papers.

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Offer withdrawn when present supply of booklets is exhausted. Orders filled as received. Send yours in now.

AMERICAN GAS ASSOCIATION, Inc.
128 EAST 15th Street, NEW YORK, N. Y.

In the District Court of Iowa in and for Woodbury County

J. R. SELKIRK,
Plaintiff
v.
SIOUX CITY GAS & ELECTRIC CO.
Defendant.

ON July 7, 1903, the City Council of Sioux City passed Ordinance No. F. 7011, of which Section 4 fixed the rates for gas for a period of twenty-five years. This ordinance was submitted to the voters of Sioux City, adopted by them, accepted and acted on by the gas company.

On the 22nd day of March, 1919, the City Council of Sioux City passed Ordinance No. J. 10051, by which the rates for gas in Sioux City were fixed at a higher rate than in Ordinance No. F.-7011.

This last ordinance was never submitted to or voted on by the electors of the city.

It was the first impression of this Court that this last ordinance, before it could become valid, should be submitted to and voted on by the people. But I find this is not the law.

The Supreme Court of Iowa in the "Case of the Iowa Ry. & Light Co., v. Jones Auto Co., et. al.," reported in the 164th *Northwestern Reporter,* page 780, decided on October 25, 1917, is exactly in point both as to the facts and on the principles of law.

By the record in the Jones case it appears that the town of Perry on March 27, 1911, gave a franchise to the plaintiff's grantor, in which the rate was fixed at a certain price and for a definite period. This ordinance was submitted to a vote of the people of Perry, adopted by them, accepted and acted upon by the Council, as in the case at bar. Afterwards the City of Perry passed an ordinance changing and making the rate higher than in the original ordinance, and this last ordinance was not submitted to or voted on by the electors of Perry. This last ordinance was contested in the Court on the ground that the rate in the original ordinance could not be changed or increased; and, further, that the ordinance attempted to fix a new rate without its having been submitted to or voted on by the people of Perry; and, further, that said ordinance changed the original contract entered into at the time of the passage of the first ordinance.

The District Court held the last ordinance good, and on appeal to the Supreme Court the case was affirmed and the ordinance fixing a higher rate was held valid. The Supreme Court of Iowa, in passing upon this proposition, said: "We see no valid reason for criticising the fixing of rates by amending a section of the franchise. It was the most direct and simple way of exercising the power, specifically conferred by Section 725 of the Code Supplement, and, *in no manner impinged upon anything on which the approval of the electors was binding.*

"Their approval was merely of the rates as temporarily settled, but with the distinct understanding that these might be increased or decreased or otherwise changed by the City Council."

The Supreme Court of Iowa in the "Case of the Town of Williams v. The Iowa Falls Electric Company," decided on February 17, 1919, and reported in the 170th *Northwestern Reporter*, page 815, in deciding said case, used the following language: "The fixing of maximum rates in a franchise ordinance is, therefore, not a contract that such rates may not be changed before the time stated in the ordinance has lapsed. It has been held that approval of such rates by the approval of the franchise on the part of the electors is merely an approval of the rates fixed by the franchise as rates temporarily settled, with a distinct understanding that the Council may change these rates either upward or downward.

"The franchise voted on by the people of Perry fixing the rates differs from the franchise voted on by the people of Sioux City, in that the Ordinance of the City of Perry provides that the City Council may change this rate. But the Supreme Court of Iowa in commenting on this Ordinance of the town of Perry says: 'That this adds nothing to Section 725 of The Code Supplement.' "

The electors of the city at any time, through their City Council can, by ordinance, fix the rate to be charged, provided always that said rate is reasonable, neither excessive to the consumer or confiscatory to the company.

Under the decisions herein cited, and under Sections 720 and 725 of the Code Supplement construed together, I find that Ordinance No. J. 10051 passed by the City Council of Sioux City on the 22nd day of March, 1919 is valid; that it was not necessary, under the law, to submit this same ordinance to a vote of the people.

I therefore find that the demurrer to the petition and amendment thereto should be, and the same is hereby, sustained.

To which ruling the plaintiff excepts.

W. G. SEAR,
District Judge.

Illinois Gas Association Committees Year Ending March, 1920

Public Relations
H. S. Whipple, Chairman
F. J. Baker — E. H. Negley
M. L. Harry — C. H. Quackenbush

Nominating
F. E. Luther, Chairman
Ray Stretch — W. F. Crossley

Technical
H. E. Bates, Chairman
E. H. Enander — A. H. Harris, Jr.

Entertainment
C. A. Luther, Chairman
H. T. Hirst — S. J. Ricker

University Fellowship
G. H. Lukes, Chairman
F. E. Luther — C. C. Boardman

Co-operative Research
C. W. Bradley, Chairman
R. B. Harper — F. W. Bedard

Canadian Gas Association 1919 Convention

Mr. George W. Allen, Secretary-Treasurer, announces that the Canadian Gas Association has definitely decided to hold its annual convention on August 21, 22, 1919, at Ontario, Canada, with headquarters at the Clifton House at Niagara Falls.

Clifton House is to be opened and operated by the United Hotel Company with Mr. G. W. O'Niel as new general manager and the Canadian Association believes that the combination of August and Niagara Falls will prove especially attractive to gas men who plan to attend the convention.

Educational Department

Conducted by ALFRED E. FORSTALL

Heating Appliances

DESIGN.—The principles and the design of the two kinds of appliances mentioned in this article, *viz.*, heating appliances and gas engines, will not be treated here in detail, because of the inability properly to do this within a limited space, and because the student of gas distribution, if interested, can easily obtain this information in other ways.

Connection.—With reference to connection practice, heating appliances can be divided into two classes; those which do not employ the Bunsen flame, and which may be known as "yellow flame" heaters, and those which do use the Bunsen principle, known as "blue flame" heaters. Generally speaking, the "blue flame" type never should be used unless provided with a flue connection, because of the possibility of products of incomplete combustion forming and passing into the room. The so-called "portable" heater, which sometimes is connected by flexible or rubber tubing and which may be moved, within limits, in the same room, or perhaps from one room to another, should be always of the "yellow flame" type. Recent developments in design have produced the heater employing a Bunsen flame to heat to incandescence a refractory material which becomes the source of heat emission, and also another type—the gas steam radiator. Because of certain elements in their design, these two types are exceptions to the rule requiring that the "blue flame" heaters be provided with a flue.

Since the connection of a heating appliance is usually simple and requires but little material, a visit by a preinspector is seldom necessary. The various processes involved up to the point of actually doing the connection work, are the same as those explained in the articles on "Appliance Work," in the January, 1919, issue and on "Cooking Appliances" in the February, 1919, issue of the MONTHLY.

Heating appliances are of such small size that the location is not often a source of contention. It should be chosen so that fire hazard will be avoided, and when a flexible tubing connection is used, so that tripping over the tubing will not be likely. When a flue is necessary, the choice of a location is limited accordingly. The three types of connection most used are the all iron pipe connection, the flexible tubing, and a combination of the two. The first should be used whenever the "portable" feature is not desired, the second when it is desired, and the third when the heater must be portable, but when the distance between the existing gas outlet and the location of the appliance is too great to permit the use of tubing for the entire distance. In such event, standard iron pipe should be run to a point near the appliance, and tubing used for the remaining distance. The tubing always should be as short as feasible for the purpose intended, and never should exceed 10 feet. It should be of the best grade obtainable, and unless some special reason demands an exception, it should be equipped at both ends with the threaded connection, the "slip" joint being avoided as far as possible. When the all iron pipe method is used the controlling cock should be placed directly at the appliance. When tubing is used, however, the cock must

be on the iron pipe at the point where the tubing connection begins, and it is better that no cock be placed at the heater. When an independent cock is used with a tubing connection, that is, when it supplies some appliance other than the heater, and therefore has two keys close together, it should be of special design intended to minimize the danger of one key being turned on, in mistake, for another.

The physical work involved in shutting off gas, when necessary, of making the connection proper, and of inspection after the work, is the same as that described under "Cooking Appliances," in the February, 1919, issue of the MONTHLY, and will not be repeated here. A "yellow flame" heater requires only the gas adjustment, which should be made by reaming out, or hammering up, the fixed orifice spud, or in some cases, by a simple needle screw adjustment. Proper adjustment means that the flames should be as large as possible, with perfect combustion, and without blowing, smoking, or contact with metal. A "blue flame" heater should be adjusted by regulating the air and gas in the way explained under "Cooking Appliances" in the February, 1919, issue of the MONTHLY. Instructions as follows should be given to the consumer after the work has been completed:

> Yellow flame heaters should be regulated by the cock on the appliance. When a tubing connection is used, with a cock at each end, both cocks should be turned off while the heater is not in use. When it is to be lit, the cock furthest from the heater should be turned on first.
>
> When lighting a gas log, or fireplace heater of similar construction, gas should be turned on full for about 5 seconds before applying the match. This allows time for the expulsion of all the explosive mixture and prevents back firing.
>
> A heater should not be turned down very low.
>
> Bends and kinks in the tubing connection should be avoided.

Because of the simplicity of the heating appliance, usually no sub-inspection of the work is necessary.

Maintenance.—Little maintenance work is required to keep a heating appliance in good condition. Poor adjustment should be taken care of by readjusting in the manner previously explained. Leaks at cocks require greasing or tightening; at burners, cementing or renewing; and at burner tips, tightening, cementing or renewing. Complaints of leaks sometimes prove to be due to an odor of incomplete combustion caused by poor adjustment, contact of flame with metal, absence of flue connection or of proper draft, and to dirt, dust, or combustion deposit in or on the appliance. A satisfactory heater should be odorless, but there is a distinction between the preventable odor, and the "dry" air sensation that is produced by a yellow flame heater too large in capacity, burning in a closed room, or burning too long, in any space. Obstructions at the heater proper occur most frequently in the burner tips, orifice, or cocks. These may be easily cleaned out. Repairs to leaking flexible tubing never should be attempted unless the tubing design is such, and the damage at such a point, that the repair can consist of cutting off the leaking portion, and replacing the end in a permanent manner. Under no conditions should a soap or tape repair be made, unless in an emergency.

Gas Engines

Connection.—The plans for a gas engine installation, which involve power calculations, shafting and machine location, and other items of a mathematical nature, should all be cared for by an expert, preliminary to the visit of the pre-

inspector who calls to measure for the piping connections and to settle the problems of meter and service. The preinspector should have available such of these plans as will be of assistance to him, and then he should proceed in accordance with the principles explained in the article on "Appliance Work" in the January, 1919, issue of the MONTHLY.

The engine should be placed on a firm, substantial foundation, where the vibrations will have the least possible harmful or annoying effect. Whenever feasible, the base should be composed of a one-three-five mixture of concrete, and should have ample depth and width. A concrete base is adaptable only when the engine is to be placed on the ground floor; when placed on an upper floor, the base should be of heavy timbers, well bolted down. The anchor bolt heads in the concrete base, should be well bedded, and the shanks incased in pipe nipples about ½ inch larger in diameter than the bolts, to allow for any slight movement necessary when putting the engine in place. The concrete should be allowed to set for several days before placing the engine on it. Afterwards, the base may be given a finished appearance by applying a coat of cement plaster.

The engine should be supplied by an independent line from the meter, and to minimize the possibility of fluctuation troubles with other appliances, it is preferable not to supply any of them from this line. The following table shows the proper size of independent line for engines of various horsepower, when the length of line is 100 feet or less. For longer distances, the size should be calculated, on the basis that the loss in pressure throughout the length will be 0.2 inch of water. The consumption rate may be taken as 20 cubic feet per horsepower per hour.

SIZE OF GAS LINE

Horsepower	Size In.
1– 5	1
6–10	1¼
11–15	1½
16–35	2
36–60	2½

The cooling water for the cylinder jacket is supplied either from a tank, so connected that the circulation will be due only to the difference in water temperature, or directly from the building supply pipe. Under the latter condition, the piping conveying the water away from the jacket is led to a sink or drain, and in the vertical piping near the cylinder is placed a break, or gap, where the temperature of the water may be felt with the hand, and its flow regulated accordingly. Below the gap, the drain line is continued, starting off with a large reducing socket which serves as a cup for the water spilling from above. From this point to the drain the line is continued at its normal size. The size of pipe is given in the following table:

SIZE OF WATER PIPING

	Tank supply		Street supply	
Horsepower	Inlet In.	Outlet In.	Inlet In.	Outlet In
1– 2	¾	¾	½	¾
3–10	1	1	½	¾
11–15	1	1	¾	1
16–30	1¼	1¼	¾	1
31–40	1½	1½	¾	1
41–50	1½	1½	1	1½

The exhaust pot or other muffling devices should be placed close to the engine, and from that point, the exhaust line should proceed as directly to the outside as possible, being limited however, to a discharge point which will not be objectionable from the standpoint of noise. Bends and horizontal runs should be avoided; a vertical run to the roof of the building is preferable. Its size should be not less than that of the engine outlet, and if it is over 25 feet in length, it should be one or two sizes larger.

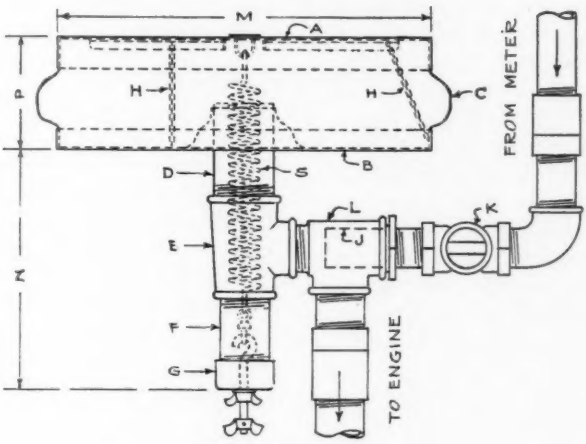


Fig. 1.—Antifluctuator

Antifluctuator.—An important feature of every gas engine connection is the device used to overcome the fluctuation in the gas pressure that is produced by the sudden pull or demand for gas by the engine on its intake stroke. When such a device is not employed, or if an ineffective one is used, the fluctuation surely will be evident throughout the gas piping system connected to the meter which supplies the engine, and perhaps its effect may extend through the street main to consumers several hundred feet away. The various devices used to overcome this, all utilize the principle of providing a chamber filled with gas, from which the engine draws its supply. Theoretically, in order entirely to stop the fluctuations, it would be necessary to have a chamber holding many times the volume of gas used per engine explosion. This theoretical space is decreased by the operation of the apparatus, which automatically reduces the storage space, as the engine simultaneously extracts gas from it. Antifluctuation devices employing these features take the form of a rubber bag, of a metal drum with rubber heads, of two metal cylinders working one within the other like a gas holder tank and lift, but with a glycerine seal and a spring tending to draw them together, and finally, of a device known as an "antifluctuator," which is the most efficient of all.

Fig. 1 shows an antifluctuator, which consists of two circular reinforced round tin discs *A* and *B*, connected with a leather diaphragm *C*, thus forming a collapsible cylinder. To disc *B* is soldered a pipe nipple *D*, which is extended downward by the tee *E*, the nipple *F*, and the cap *G*. A spring *S*, of which the tension may be adjusted, is connected between disc *A* and cap *G*, and tends to draw the two discs together. The action and the effect of the apparatus, is as follows. When cock *K* is open, the antifluctuator is filled with gas flowing through pipe *J*. At this time the whole supply system is filled with gas, not in motion, and with a pressure similar at all points.

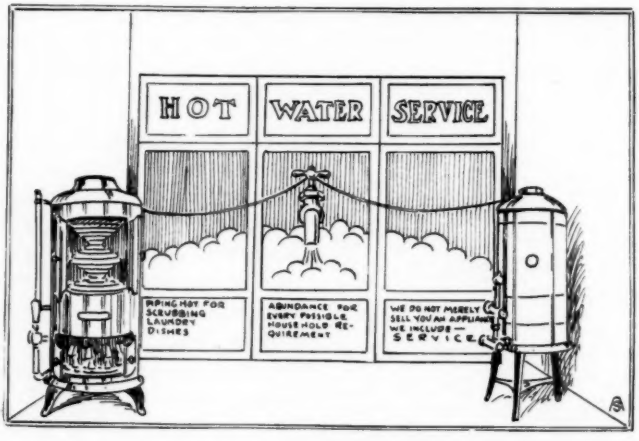
Under these conditions, spring *S* is extended to the limit allowed by chains *H*. When the inlet valve of the engine opens, gas is sucked into the cylinder out

of the antifluctuator, rather than directly through pipe *J*, because the former path offers less resistance to flow than the latter. After the inlet valve closes, the antifluctuator fills again, and then it is ready to supply more gas whenever the demand occurs. The suction out of the antifluctuator is so rapid that if it were a cylinder of constant volume, a tendency to vacuum would be created, and a fluctuation in the gas pressure produced, that certainly would be noticeable on any gas appliance connected to the same line of piping, and that might be transferred to the street main and thence to other consumers. However, as gas is drawn out of the antifluctuator, the pressure within it is decreased and the contracting spring reduces the space within as the gas is pulled out. The result is that practically no fluctuation occurs.

Maintenance.—The maintenance of a gas engine involves comparatively little from the gas supply standpoint. Repairs and adjustments to the mechanism usually are made by the owner himself, except those of more extensive character, which in some situations are performed by the gas company's experts, or by the local agent for the engine.

H. B. ANDERSEN.

Timely Suggestion for Owners of A. G. A. Screen


HOT
WATER
SERVICE
PIPING HOT FOR SCRUBBING LAUNDRY DISHES
ABUNDANCE FOR EVERY POSSIBLE HOUSEHOLD REQUIREMENT
WE DO NOT MERELY SELL YOU AN APPLIANCE WE INCLUDE — SERVICE

Simple Design for Hot Water Week

The above cut, one of the designs prepared for the May American Gas Association Window Display Service, shows a good window layout for National Gas Water Heater Week, June 9-14, with the A. G. A. background screen in use.

The central panels are covered with white muslin and by means of water paint in deep blue, the background above the uneven line of steam is filled in. The steam effect is secured with heavy white water paint and an occasional touch of blue brushed on in short circular lines. The work can be done by any amateur painter.

The signs are painted on cardboard and inserted with a turn of the screw—no tacks or paste.

New Members Enrolled in the American Gas Association, Inc.
April 1-30, 1919, Inclusive.

GAS COMPANY MEMBERS

Escanaba Municipal Utilities .....L. D. Goddard, Escanaba, Mich.
Central Gas Co. .....W. B. Brown, Mt. Pleasant, Mich.
Billings Gas Co. .....R. C. Cardell, Billings, Mont.
Bristol County Gas & Electric Co.....Arthur B. Lisle, Providence, R. I.
St. Johnsbury Gas Co.....John T. Carroll, St. Johnsbury, Vt.

MANUFACTURING COMPANY MEMBERS

A-B Stove Co. .....P. C. DeVoe, Battle Creek, Mich.
The Cutler-Hammer Mfg. Co.....J. C. Wilson, Milwaukee, Wis.
The Bryant Heater & Mfg. Co.....C. L. Bryant, Cleveland, Ohio
Helme & McIlhenny .....J. D. McIlhenny, Philadelphia, Pa.
Wm. Kane Mfg. Co.....Wm. Kane, Philadelphia, Pa.
Meek Oven Mfg. Co.....C. H. French, Newark, N. J.
Metric Metal Works .....F. H. Payne, Erie, Pa.
F. W. Ofeldt & Sons.....E. G. Ofeldt, Nyack, N. Y.
The A. H. Wolff Gas Radiator Co.....M. S. Wolff, New York, N. Y.

Active Members

CALIFORNIA

Roberts & Mander Stove Co., Santa Monica
R. Lockwood Moss

COLORADO

Denver Gas & Elec. Lt. Co., Denver
Thomas E. Boyd

CONNECTICUT

Danbury & Bethel Gas & Elec. Co., Danbury
W. P. Guinan
Hartford City Gas Co., Hartford
E. E. Eysenbach
The Reeves Mfg. Co., Milford
Edwin A. Reeves
New Haven Gas Light Co., New Haven
Howard E. White

GEORGIA

Gas Light Co. of Augusta, Augusta
F. L. Marshall

ILLINOIS

George M. Clark & Co., Chicago
Robert K. Clark
Connelly Iron Sponge & Gov. Co., Chicago
Arthur L. Smyly
The Gas Record, Chicago
Herbert Graffis
W. J. Huddle & Co., Chicago
W. J. Huddle
Ingersoll-Rand Co., Chicago
Wm. L. Scantlin
Peoples Gas Light & Coke Co., Chicago
Rudolph Schenck
John Zander
Public Service Co. of Northern Ill., Chicago
C. W. Bradley
Robins Conveying Belt Co., Chicago
C. Kemble Baldwin
Springfield Gas & Elec. Co., Springfield
George H. Dawson
North Shore Gas Co., Waukegan
Julian G. Hart

INDIANA

P. H. & F. M. Roots Co., Connersville
E. D. Johnston
Semet-Solvay Co., Indianapolis
H. M. Chapman
Central Indiana Gas Co., Muncie
Robert S. Miller
Citizens Gas & Fuel Co., Terre Haute
C. D. Shaul

IOWA

Tri-City Railway & Light Co., Davenport
B. J. Denman
The Key City Gas Co., Dubuque
George McLean
Oskaloosa Light & Fuel Co., Oskaloosa
J. H. Porter

KANSAS

Citizens Lt., Ht. & Pr. Co., Lawrence
Caryl J. Dodds

LOUISIANA

Baton Rouge Electric Co., Baton Rouge
C. E. Bell

MARYLAND

Bartlett Hayward Co., Baltimore
Alten S. Miller
Con. Gas, Elec. Lt. & Pr. Co., Baltimore
B. A. Duvall
Frederick J. Ikena

MASSACHUSETTS

General Gas Light Co., Allston
William H. West
Attleboro Gas Light Co., Attleboro
Wm. J. Luther
Boston Cons. Gas Co., Boston
Edward W. Berchtold
Edwin A. Clark
L. J. Joyce
H. E. Wilkins

Gas & Electric Improvement Co., Boston
William Gould
New England Coal & Coke Co., Boston
William J. Lavelle
Stone & Webster, Boston
W. H. Blood, Jr.
Walker & Pratt Mfg. Co., Boston
Arthur W. Walker
Brockton Gas Light Co., Boston
J. B. Anderson
New England Fuel & Transp. Co., Everett
Robert M. Folsom
Charles A. Raymond
Lowell Gas Light Co., Lowell
George Nash
Lynn Gas & Electric Co., Lynn
Francis E. Drake
New Bedford Gas & Edison Lt. Co., New Bedford
Charles R. Price
Springfield Gas Light Co., Springfield
Frederick L. Belcher
Herman Burgi
Edward S. Bliss
John S. Fox
Eugene Milliken
George C. Murphy
Weir Stove Co., Taunton
Joseph L. Anthony

MICHIGAN

Detroit City Gas Co., Detroit
J. W. Batten
C. W. Bennett
Frank S. Fugate
Andrew N. Outzen
Detroit Stove Works, Detroit
W. T. Barbour
Michigan Stove Co., Detroit
John V. Peck
Michigan Light Co., Flint
R. H. Lawlor
Grand Rapids Gas Lt. Co., Grand Rapids
Seymour W. Cheney
C. E. Gray, Jr.
John A. Hulswit
Michigan Light Co., Jackson
C. W. Tippy

MISSISSIPPI

Southern Railway & Light Co., Natchez
Frank J. Duffy

MISSOURI

Laclede Gas Light Co., St. Louis
O. J. A. Lundblad
St. Joseph Gas Co., St. Joseph
Wylie Mitchell

MONTANA

Billings Gas Co., Billings
R. C. Cardell

NEBRASKA

Lincoln Gas & Elec. Light Co., Lincoln
J. E. Shuff

NEW JERSEY

Atlantic City Gas Co., Atlantic City
Louis N. Yetter
Public Service Gas Co., Bayonne
A. H. Glendinning
Public Service Gas Co., Elizabeth
Harry P. Chandler
Isbell-Porter Co., Newark
Robert K. Wehner
Public Service Gas Co., Newark
E. M. Bailey
James P. Hanlan
W. H. Pettes
H. H. Wells
Ruud Mfg. Co., Newark
Frank J. Savage
Public Service Gas Co., Paterson
H. W. Hennig
J. F. McGuire
Ernest Morrell
N. H. Potter
Ralph I. Wilson
Didier-March Co., Perth Amboy
George A. Balz
Cons. Gas Co. of N. J., Red Bank
A. H. Hagerman
Joseph S. Harrison
Public Service Gas Co., Rutherford
Andrew Pruden
A. R. Smith
Public Service Gas Co., Trenton
James H. Galt
Public Service Gas Co., West New York
E. V. Walsh

NEW YORK

D. McDonald & Co., Albany
Frederick McDonald
Rochester Railway & Light Co., Canandaigua
Thomas M. Couvegan
Central Union Gas Co., New York
Daniel F. Creeden
Adolph C. Johnson
Nils T. Sellman
C. G. M. Thomas
C. W. Waddington
Northern Union Gas Co., New York
Frederick R. DeVoe
A. M. Dickson
W. J. MacDaniel
Norton, Bird & Whitman, Engineers, New York
W. J. Norton
Standard Oil Co. of N. Y., New York
C. M. Higgins
United Gas & Elec. Engr. Corp., New York
Alan E. Lockwood
John C. Williams, Inc., New York
John C. Williams
Westchester Lighting Co., Mt. Vernon
A. L. Spears
Northern Westchester Ltg. Co., Ossining
J. M. Beatty
Orville G. Bennett
Rochester Railway & Light Co., Rochester
A. M. Beebe
William H. Earle
J. B. Eaton
Frank Hellen
V. C. Hoddick

J. T. Hutchings
I. Lundgaard
Joseph P. MacSweeney
V. A. Miller
F. H. Patterson
H. Russell
L. E. Sanderson
E. C. Scobell
Robert M. Searle
Leo. J. Sullivan
W. N. Whitney

Rome Gas, Elec. Lt. & Pr. Co., Rome
John D. Flanagan

Saranac Lake Gas Co., Saranac Lake
M. W. Bogue

General Electric Co., Schenectady
W. D'A. Ryan

Westcott Valve Co., Seneca Falls
Frank Cavenagh

Syracuse Lighting Co., Syracuse
Frederick C. Crarer

Westchester Lighting Co., Tarrytown
E. R. Conover

Ludlow Valve Mfg. Co., Troy
James H. Caldwell

Westchester Lighting Co., Yonkers
Edward O. Baxter

OHIO

The Ashtabula Gas Co., Ashtabula
F. W. Stone

Stacey Bros. Gas Constr. Co., Cincinnati
A. J. Stacey
Wm. A. Miller

Reliable Stove Co., Div., Cleveland
H. C. Fritz

National Stove Co., Lorain
Carey A. Moore

Semet-Solvay Co., Portsmouth
C. E. Lewars

Toledo Railways & Lt. Co., Toledo
Alfred Johnson

The Block Gas Mantle Co., Youngstown
Otto Kaufmann

OKLAHOMA

MacThwaite Oil & Gas Co., Ada
M. Webb Offutt

PENNSYLVANIA

Weston Dodson & Co., Inc., Bethlehem
John H. McNally

H. D. Walbridge & Co., Clearfield
Warren Partridge

James Gardner, Jr., Co., Ebensburg
N. A. Young

American Gas Co., Philadelphia
S. P. Curtis

Deily & Fowler Mfg. Co., Philadelphia
J. Scott Fowler

Tampa Water Works Co., Philadelphia
Edward R. Wood, Jr.

United Chemical & Industrial Co., Philadelphia
Walter Whetstone

Welsbach St. Ltg. Co. of Amer., Philadelphia
Daniel J. Prendergast
Arthur E. Shaw
F. Victor Westermaier

Chaplin Fulton Mfg. Co., Pittsburgh
W. McKee

Phila. Suburban Gas & Elec. Co., Pottstown
A. P. McCarthy

Hyde Park Gas Co., Scranton
Worthington Scranton

RHODE ISLAND

Builders' Iron Foundry, Providence
Charles G. Richardson

Providence Gas Co., Providence
E. H. Bauer
R. L. Fletcher
Carl G. Peterson

TEXAS

The Dallas Gas Co., Dallas
H. C. Morris

San Antonio Public Service Co., San Antonio
Frank L. Weisser

VERMONT

The G. S. Blodgett Co., Inc., Burlington
R. L. Patrick

VIRGINIA

Lynchburg Traction & Lt. Co., Lynchburg
W. G. Claytor

WISCONSIN

Claus Automatic Gas Cock Co., Milwaukee
W. E. Claus

Milwaukee Gas Lt. Co., Milwaukee
Arno C. Wilke

Wisconsin Gas & Elec. Co., Racine
D. E. Callender

Wausau Gas Co., Wausau
H. H. Wilson

CANADA

Montreal Lt., Ht. & Pr. Co., Montreal
George A. Galey
H. N. Osler
E. S. Stanton

Quebec Ry., Lt., Ht. & Pr. Co., Ltd., Quebec
R. A. Wallace

Economical Gas Appar. Constr. Co., Toronto
Frederick Burnett

Public Utilities Commission, Winnipeg
Hugh McNair

ENGLAND

George Bray & Co., Ltd., Leeds
Arthur Bray

MISCELLANEOUS

John Cabot, Mfr. Gas Trays and Grids, Hoboken, N. J.

Roger W. Polk, Consulting Engineer, Chicago, Ill.

Dr. N. Wiley Thomas, Chief of Bureau of Gas, Philadelphia, Pa.

AMERICAN GAS ASSOCIATION, Inc.

List No. 29—May, 1919.

Rate Increases Secured.

Where information is not secured from company receiving increase, the source of information is noted in brackets. See Cumulative List of February 5, 1919, for explanation of abbreviations. This list includes only increases reported as secured subsequent to February 5, 1919.

CALIFORNIA

Stockton: Western States Gas & Elec. Co. reports second increase, effective Mar. 20, 1919. 1st 25 MCF $1.10 net per M—next 25 MCF $1.00—next 25 MCF 95¢—next 25 MCF 85¢—next 25 MCF 75¢—all over 125 MCF 70¢ per M net 10 days. M. M. chge. 70¢ net per meter.

Ukiah: E. J. reports increase, effective Apr. 15, 1919. New rate: 1st 400 CF $1.00—next 2,600 CF $2.10 per M—next 5 MCF $1.70—next 7 MCF $1.50 per M—over 15 MCF $1.25 per M—M. M. Chge. 75¢.

DISTRICT OF COLUMBIA

Georgetown: Gas Light Co. reports second increase, effective Mar. 20, 1919. $1.05 gro. per MCF—95¢ net 10 days.

Washington: Gas Light Co. reports second increase, effective Mar. 20, 1919. $1.05 gro per MCF— 95¢ net 10 days. In both companies new rate effective Mar. 20 to Sept. 20 when rate automatically returns to original rate unless after further hearing P. S. C. allows continuance.

ILLINOIS

Murphysboro: Waterworks & Elec. & Gas Lt. Co. reports increase, effective Apr. 1, 1919. Old rate: $1.20 gro., $1.10 net per M. New rate: $1.35 gro., $1.25 net per M.

INDIANA

Lafayette: Northern Indiana Gas & Elec. Co. reports P. S. C. Apr. 10, granted increase, effective May 1, 1919. Old rate: 1st 10 MCF $1.00—Next 20 MCF 90¢—next 20 MCF 80¢—over 50 MCF 70¢ per M—Disc. 10¢ per M each block. New rate: 1st 5 MCF $1.00—next 25 MCF 95¢—next 45 MCF 90¢—all over 75 MCF 85¢—disc. 10¢ per M, each block.

MARYLAND

Crisfield: Light & Power Co. was granted an increase from $1.25 per MCF to $1.70 gro., less 10¢ per M disc. 10 days, effective July 1, 1917. Application was made Mar. 1919 for increase to $2.00 per M which was opposed by Mayor and City Council based on clause in Charter prohibiting higher rate than $1.25 per M. Co. reports "As P. S. C. has not prohibited the $2.00 rate, company has proceeded to collect it, and is now selling at $2.00 per MCF less 10¢ per M 10 days."

MISSOURI

Independence: Jackson County Lt., Ht. & Pr. Co. reports second increase allowed by P. S. C., effective April 21, 1919. New rate: 1st 5 MCF $1.40 per M—next 5 MCF $1.25 per M—all over 10 MCF $1.10 per M—disc. 10¢ per M, prompt pay. M. M. Chge. 75¢.

NEW YORK

Alden: Alden-Batavia Natural Gas Co. reports P. S. C. grants increase, effective May 20, 1919, from 30¢ to 35¢ per MCF—disc. from 5¢ per M to 2½¢, prompt pay.

WEST VIRGINIA

Charleston: Charleston-Dunbar Natural Gas Co. reports for Industrial Meters. Old rate: 150 MCF 19¢ gro., 18¢ net per M—next 150 MCF 16¢ gro., 15¢ net per M—all over 300 MCF 11¢ gro. 10¢ net per MCF. New rate effective Apr. 1, 1919—1st 150 MCF 19¢ gro., 18¢ net per M—all over 150 MCF 17¢ gro., 16¢ net per M.

PHILIPPINE ISLANDS

Manila: Gas Corp. reports three increases during war time, Mar. 15, 1917 from old rate 4¢ to 4½¢ per cub. m.—Aug. 15, 1917, from 4½¢ to 6¢—Aug. 15, 1918, from 6¢ to 8¢ per cub. m.

Classified Directory--Manufacturers of Gas Equipment

Company Members Only, American Gas Association, Inc.

ARC LAMPS (Gas)
- General Gas Light Co., New York, N. Y., and Kalamazoo, Mich.
- Welsbach Co., Gloucester, N. J.

BENCH IRON WORK
- The Bartlett Hayward Co., Baltimore, Md.
- The Gas Machinery Co., Cleveland, Ohio
- The Improved Equipment Co., 60 Wall St., New York, N. Y.
- The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.
- The Stacey Mfg. Co., Cincinnati, Ohio

BOILERS (Gas)
- Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
- General Gas Appliance Co., 103 Park Ave., New York, N. Y.
- Kidde & Co., 169 Chambers St., New York, N. Y.
- F. W. Ofeldt & Sons, Nyack, N. Y.
- The Bryant Heater & Mfg. Co., Cleveland, Ohio
- The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

BOILERS (Gas for House Heating)
- Kidde & Co., 169 Chambers St., New York, N. Y.
- The Bryant Heater & Mfg. Co., Cleveland, Ohio

BOILERS (Waste Heat)
- The Bartlett Hayward Co., Baltimore, Md.

BLOWERS, BOOSTERS, EXHAUSTERS
- Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
- The Gas Machinery Co., Cleveland, Ohio
- The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
- The C. M. Kemp Mfg. Co., Baltimore, Md.
- The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

BRAZING TABLES
- Rathbone, Sard & Co., Albany, N. Y.
- The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

BROILERS (Hotel)
- Rathbone, Sard & Co., Albany, N. Y.
- The Michigan Stove Co., Detroit, Mich.

BURNERS (Industrial)
- Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
- Equitable Meter Co., Pittsburgh, Pa.
- General Fire Extinguisher Co., Providence, R. I.
- General Gas Appliance Co., 103 Park Ave., New York, N. Y.
- International Hale Gas Mixer Co., Providence, R. I.
- Tate-Jones & Co., Inc., 50 Church St., New York, N. Y.
- The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
- The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
- The C. M. Kemp Mfg. Co., Baltimore, Md.
- The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

BURNERS (Lighting)
- American Meter Co., Inc., 105 W. 40th St., New York, N. Y.
- Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
- General Gas Light Co., New York, N. Y., and Kalamazoo, Mich.
- Lindsay Light Co., New York, N. Y., and Chicago, Ill.
- Welsbach Co., Gloucester, N. J.

BY-PRODUCT OVENS
- By-Product Coke Corp., Chicago, Ill.
- Semet-Solvay Co., Syracuse, N. Y.
- The Gas Machinery Co., Cleveland, Ohio
- The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.

BY-PRODUCT RECOVERY APPARATUS
- Isbell-Porter Co., Newark, N. J.
- The Bartlett Hayward Co., Baltimore, Md.
- The Gas Machinery Co., Cleveland, Ohio

CALORIMETERS
- American Meter Co., Inc., 105 W. 40th St., New York, N. Y.
- D. McDonald & Co., Albany, N. Y.
- Maryland Meter Works, Baltimore, Md.
- Nathaniel Tufts Meter Works, 455 Commercial St., Boston, Mass.

CASING, TUBING (Steel)
- National Tube Co., Frick Bldg., Pittsburgh, Pa.

CHARGING COAL
- The Bartlett Hayward Co., Baltimore, Md.
- The Gas Machinery Co., Cleveland, Ohio

COAL AND COKE (Conveyors, Crushers, Screeners)
- R. H. Beaumont Co., 315 Arch St., Philadelphia, Pa.

The Bartlett Hayward Co., Baltimore, Md.
The Gas Machinery Co., Cleveland, Ohio

COCKS (Ranges, Water Heaters, Service and Meter)
Hays Mfg. Co., Inc., Erie, Pa.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
Standard Brass Works, Detroit, Mich.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Roberts Brass Mfg. Co., Detroit, Mich.

COMPRESSORS
The C. M. Kemp Mfg. Co., Baltimore, Md.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

CONDENSERS
Camden Iron Works, Camden, N. J.
Cruse-Kemper Co., Ambler, Pa.
Isbell-Porter Co., Newark, N. J.
The Bartlett Hayward Co., Baltimore, Md.
The Gas Machinery Co., Cleveland, Ohio
The Stacey Mfg. Co., Cincinnati, Ohio
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio
Steere Engineering Co., Detroit, Mich.

COOKING AUXILIARIES
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
The G. S. Blodgett Co., Burlington, Vt.
The General Gas Appliance Co., 103 Park Ave., New York, N. Y.

COUPLINGS
S. R. Dresser Mfg. Co., Bradford, Pa.

CYLINDERS (Pressure)
National Tube Co., Frick Bldg., Pittsburgh, Pa.

DECALCOMANIA PRODUCTS
The Meyercord Co., Inc., Chamber of Commerce Bldg., Chicago, Ill.

EXCHANGERS (Heat)
The Bartlett Hayward Co., Baltimore, Md.

EXPERT APPRAISAL
Steere Engineering Co., Detroit, Mich.

EXTRACTORS (Tar, Dust, Fumes)
The Bartlett Hayward Co., Baltimore, Md.

FITTINGS
Will W. Barnes, 31 Chelsea Place, East Orange, N. J.
S. R. Dresser Mfg. Co., Bradford, Pa.
Eriez Stove & Mfg. Co., Erie, Pa.
General Fire Extinguisher Co., Providence, R. I.
Kitson Co., 2827 Oakford St., Philadelphia, Pa.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
Shapiro & Aronson, Inc., 20 Warren St., New York, N. Y.
Standard Brass Works, Detroit, Mich.
The Gas Machinery Co., Cleveland, Ohio
The Roberts Brass Mfg. Co., Detroit, Mich.
Welsbach Co., Gloucester, N. J.

FITTINGS (Malleable Iron)
Stanley G. Flagg & Co., 1421 Chestnut St., Philadelphia, Pa.

FLEXIBLE TUBING
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Titeflex Metal Hose Corp., Badger Ave., Newark, N. J.

FLASHLIGHTS AND BATTERIES
Will W. Barnes, 31 Chelsea Place, East Orange, N. J.

FUEL BRIQUETTING
General Briquetting Co., 25 Broad St., New York, N. Y.

FURNACES
Eriez Stove & Mfg. Co., Erie, Pa.
Geist Mfg. Co., Atlantic City, N. J.
Tate-Jones & Co., Inc., 50 Church St., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

GAS ENGINES
The Bartlett Hayward Co., Baltimore, Md.
United Lead Co., 111 Broadway, New York, N. Y.

GAS ENGINE COCKS AND VALVES
Standard Brass Works, Detroit, Mich.

GAS IRONS
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Strauss Gas Iron Co., Philadelphia, Pa.

GAS MIXERS
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Eriez Stove & Mfg. Co., Erie, Pa.
Geist Mfg. Co., Atlantic City, N. J.
General Fire Extinguisher Co., Providence, R. I.
Hays Mfg. Co., Inc., Erie, Pa.
Improved Appliance Co., Inc., 419 Kent Ave., Brooklyn, N. Y.
International Hale Gas Mixer Co., Providence, R. I.
Strait & Richards, Inc., Newark, N. J.

Tate-Jones & Co., Inc., 50 Church St., New York, N. Y.
The C. M. Kemp Mfg. Co., Baltimore, Md.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

GAS PLANTS (Blue)
The Bartlett Hayward Co., Baltimore, Md.
The Gas Machinery Co., Cleveland, Ohio

GAS PLANTS (Carbureted Water)
Gas Machinery Co., Cleveland, Ohio
The Bartlett Hayward Co., Baltimore, Md.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Stacey Mfg. Co., Cincinnati, Ohio

GAS PLANTS (Coal) (Engineers)
Camden Iron Works, Camden, N. J.
Isbell-Porter Co., Newark, N. J.
Semet-Solvay Co., Syracuse, N. Y.
Steere Engineering Co., Detroit, Mich.
The Bartlett Hayward Co., Baltimore, Md.
The Gas Machinery Co., Cleveland, Ohio
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.
The Stacey Mfg. Co., Cincinnati, Ohio
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio

HEATERS (Space)
American Stove Co., St. Louis, Mo.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Eriez Stove & Mfg. Co., Erie, Pa.
Estate Stove Co., Hamilton, Ohio
Geist Mfg. Co., Atlantic City, N. J.
General Fire Extinguisher Co., Providence, R. I.
General Gas Light Co., New York, N. Y., and Kalamazoo, Mich.
Kidde & Co., 169 Chambers St., New York, N. Y.
Lawson Mfg. Co., Pittsburgh, Pa.
Reznor Mfg. Co., Mercer, Pa.
Roberts & Mander Stove Co., Philadelphia, Pa.
Strait & Richards, Inc., Newark, N. J.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Mead Gas Heater Co., Delawanna, N. J.

HEATERS (Garage)
Kidde & Co., 169 Chambers St., New York, N. Y.

HEATERS (Pressing and Soldering Irons)
American Stove Co., St. Louis, Mo.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Eclipse Gas Stove Co., Rockford, Ill.
Estate Stove Co., Hamilton, Ohio
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Strait & Richards, Inc., Newark, N. J.
The Bryant Heater & Mfg. Co., Cleveland, Ohio
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

HIGH PRESSURE SYSTEMS
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
General Fire Extinguisher Co., Providence, R. I.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
Selas Co., 521 W. 23d St., New York, N. Y.
The Gas Machinery Co., Cleveland, Ohio
The C. M. Kemp Mfg. Co., Baltimore, Md.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

HOT PLATES
American Stove Co., St. Louis, Mo.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Eriez Stove & Mfg. Co., Erie, Pa.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Rathbone, Sard & Co., Albany, N. Y.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Michigan Stove Co., Detroit, Mich.
Union Stove Works, 20 Beekman St., New York, N. Y.
Weir Stove Co., Taunton, Mass.

INCINERATORS
Estate Stove Co., Hamilton, Ohio
Ruud Mfg. Co., Pittsburgh, Pa.

INSTRUMENTS (Measuring, Testing and Recording)
American Meter Co., 105 W. 40th St., New York, N. Y.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Equitable Meter Co., Pittsburgh, Pa.
D. McDonald & Co., Albany, N. Y.
Maryland Meter Works, Baltimore, Md.
Steere Engineering Co., Detroit, Mich.

KILNS (For Firing Glass, China and Pottery)
B. F. Drakenfeld & Co., Inc., 50 Murray St., New York, N. Y.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

LIGHTERS (Ranges)
Safety Gas Lighter Co., Haverhill, Mass.
Strauss Gas Iron Co., Philadelphia, Pa.
The Michigan Stove Co., Detroit, Mich.
Welsbach Co., Gloucester, N. J.

LIGHTING (Fixtures)
Will W. Barnes, 31 Chelsea Place, East Orange, N. J.
Shapiro & Aronson, Inc., 20 Warren St., New York, N. Y.
Welsbach Co., Gloucester, N. J.

LIGHTING (Gas Domes, Portables, etc.)
Will W. Barnes, 31 Chelsea Place, East Orange, N. J.
Kramer Bros. Lamp Co., 585 Broadway, New York, N. Y.
Shapiro & Aronson, Inc., 20 Warren St., New York, N. Y.
Welsbach Co., Gloucester, N. J.

LIGHTING (Glassware)
Shapiro & Aronson, Inc., 20 Warren St., New York, N. Y.
Welsbach Co., Gloucester, N. J.

LIGHTING (Incidentals)
Storrs Mica Co., Owego, N. Y.

LIGHTING (Mantles)
General Gas Light Co., New York, N. Y., and Kalamazoo, Mich.
Lindsay Light Co., New York, N. Y., and Chicago, Ill.
Welsbach Co., Gloucester, N. J.

METAL RECEPTACLES
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.
United Lead Co., 111 Broadway, New York, N. Y.

METERS
American Meter Co., 105 W. 40th St., New York, N. Y.
Cleveland Gas Meter Co., Cleveland, Ohio
Equitable Meter Co., Pittsburgh, Pa.
John J. Griffin & Co., 1521 Race St., Philadelphia, Pa.
Helme & McIlhenny, 1349 Cherry St., Philadelphia, Pa.
D. McDonald & Co., Albany, N. Y.
Maryland Meter Works, Baltimore, Md.
Superior Meter Co., Bush Terminal, Brooklyn, N. Y.
The Cleveland Rotary Meter Co., Cleveland, Ohio
The Sprague Meter Co., Bridgeport, Conn.
Nathaniel Tufts Meter Works, 455 Commercial St., Boston, Mass.
Rotary Meter Co., 52 Vanderbilt Ave., New York, N. Y.

METER CONNECTIONS, SEALS, Etc.
American Meter Co., 105 W. 40th St., New York, N. Y.
Cleveland Gas Meter Co., Cleveland, Ohio
S. R. Dresser Mfg. Co., Bradford, Pa.
Equitable Meter Co., Pittsburgh, Pa.
Helme & McIlhenny, 1349 Cherry St., Philadelphia, Pa.
D. McDonald & Co., Albany, N. Y.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
Superior Meter Co., Bush Terminal, Brooklyn, N. Y.
The Lattimer Stevens Co., Columbus, Ohio
The Sprague Meter Co., Bridgeport, Conn.
Nathaniel Tufts Meter Works, 455 Commercial St., Boston, Mass.

METER PROVERS
American Meter Co., 105 W. 40th St., New York, N. Y.
Equitable Meter Co., Pittsburgh, Pa.
John J. Griffin & Co., Philadelphia, Pa.
Helme & McIlhenny, 1349 Cherry St., Philadelphia, Pa.
D. McDonald & Co. Albany, N. Y.
Maryland Meter Works, Baltimore, Md.
Superior Meter Co., Bush Terminal, Brooklyn, N. Y.
Nathaniel Tufts Meter Works, 455 Commercial St., Boston, Mass.

METER SHELF
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.

OIL (Diaphragm)
John J. Griffin & Co., 1521 Race St., Philadelphia, Pa.

OVENS (Baking and Cooking)
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Eclipse Gas Stove Co., Rockford, Ill.
General Fire Extinguisher Co., Providence, R. I.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Meek Oven Mfg. Co., 70 Park Place, New York, N. Y.
The G. S. Blodgett Co., Burlington, Vt.
The Crandall-Pettee Co., Hudson St., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Ohio State Stove & Mfg. Co., Columbus, Ohio
The Union Steel Products Co., Ltd., Albion, Mich.
The Surface Combustion Co., 366 Gerard Ave., Bronx, N. Y.

OVENS (Annealing, Japanning, Drying, Core, etc.)
Gehnrich Indirect Heat Oven Co., Inc., 62 Franklin Ave., Brooklyn, N. Y.
General Fire Extinguisher Co., Providence, R. I.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.

Meek Oven Mfg. Co., 70 Park Place, New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The C. M. Kemp Mfg. Co., Baltimore, Md.
The Surface Combustion Co., 366 Gerard Ave., New York, N. Y.
The Union Steel Products Co., Ltd., Albion, Mich.
Young Bros. Co., Detroit, Mich.

OVENS (Warming)
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Eclipse Gas Stove Co., Rockford, Ill.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Meek Oven Mfg. Co., 70 Park Place, New York, N. Y.
The G. S. Blodgett Co., Burlington, Vt.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Union Steel Products Co., Ltd., Albion, Mich.

PHOTOMETERS
American Meter Co., 105 W. 40th St., New York, N. Y.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
D. McDonald & Co., Albany, N. Y.
Maryland Meter Works, Baltimore, Md.
Nathaniel Tufts Meter Works, Boston, Mass.

PIPE
Camden Iron Works, Camden, N. J.
General Fire Extinguisher Co., Providence, R. I.
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Steere Engineering Co., Detroit, Mich.
The Bartlett Hayward Co., Baltimore, Md.
United Lead Co., 111 Broadway, New York, N. Y.

PIPE CASTINGS AND SPECIALS
The Bartlett Hayward Co., Baltimore, Md.
The Stacey Mfg. Co., Cincinnati, Ohio

PIPE CLAMPS AND SLEEVES
S. R. Dresser Mfg. Co., Bradford, Pa.

PIPE PACKING
General Fire Extinguisher Co., Providence, R. I.
United Lead Co., 111 Broadway, New York, N. Y.

PIPE TOOLS (Caulking, Cutting, Tapping)
General Fire Extinguisher Co., Providence, R. I.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
United Lead Co., 111 Broadway, New York, N. Y.

PLATE WARMERS
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

PORCELAIN ENAMEL PARTS
(Stoves, Lamps, Linings, Stamping and Spinnings)
Baltimore Enamel & Novelty Co., Baltimore, Md.
Eclipse Gas Stove Co., Rockford, Ill.
The Enamel Products Co., Cleveland, Ohio
The Union Steel Products Co., Ltd., Albion, Mich.

PRESSURE GAUGES
American Meter Co., 105 W. 40th St., New York, N. Y.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Equitable Meter Co., Pittsburgh, Pa.
General Fire Extinguisher Co., Providence, R. I.
D. McDonald & Co., Albany, N. Y.
Maryland Meter Works, Baltimore, Md.
Superior Meter Co., Bush Terminal, Brooklyn, N. Y.
The Bryant Heater & Mfg. Co., Cleveland, Ohio
The Cleveland Rotary Meter Co., Cleveland, Ohio.
The Gas Machinery Co., Cleveland, Ohio
Nathaniel Tufts Meter Works, Boston, Mass.

PUMPS
American Meter Co., 105 W. 40th St., New York, N. Y.
Gas Machinery Co., Cleveland, Ohio
Nathaniel Tufts Meter Works, Boston, Mass.

PURIFIERS
Camden Iron Works, Camden, N. J.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Cruse-Kemper Co., Ambler, Pa.
Gas Machinery Co., Cleveland, Ohio
Isbell-Porter Co., Newark, N. J.
Steere Engineering Co., Detroit, Mich.
The Bartlett Hayward Co., Baltimore, Md.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio
The Stacey Mfg. Co., Cincinnati, Ohio

PURIFYING MATERIALS
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.

RADIATORS
James B. Clow & Sons, Chicago, Ill.

Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Eriez Stove & Mfg. Co., Erie, Pa.
General Fire Extinguisher Co., Providence, R. I.
Kidde & Co., 169 Chambers St., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Mead Gas Heater Co., Delawanna, N. J.

RANGES (Domestic)

American Stove Co., St. Louis, Mo.
Bartlett & Co., Inc., Philadelphia, Pa.
Comstock-Castle Stove Co., Quincy, Ill.
Abram Cox Stove Co., Philadelphia, Pa.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Eriez Stove & Mfg. Co., Erie, Pa.
Estate Stove Co., Hamilton, Ohio
The General Gas Appliance Co., 103 Park Ave., New York, N. Y.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Rathbone, Sard & Co., Albany, N. Y.
Roberts & Mander Stove Co., Philadelphia. Pa.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Michigan Stove Co., Detroit, Mich.
The Ohio State Stove & Mfg. Co., Columbus, Ohio
The Peninsular Stove Co., Detroit, Mich.
Union Stove Works, 70 Beekman St., New York, N. Y.
Vesta Gas Range & Mfg. Co., Chattanooga, Tenn.
Weir Stove Co., Taunton, Mass.

RANGES (Hotel)

American Stove Co., St. Louis, Mo.
Comstock-Castle Stove Co., Quincy, Ill.
Abram Cox Stove Co., Philadelphia, Pa.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Estate Stove Co., Hamilton, Ohio
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Roberts & Mander Stove Co., Philadelphia, Pa.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Michigan Stove Co., Detroit, Mich.

REFRACTORY MATERIALS

Harbison-Walker Refractories Co., Pittsburgh, Pa.
Tate-Jones & Co., Inc., 50 Church St., New York, N. Y.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.

REGULATORS (Governors)

American Meter Co., 105 W. 40th St., New York, N. Y.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Equitable Meter Co., Pittsburgh, Pa.
Gas Machinery Co., Cleveland, Ohio
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.
Reynolds Gas Regulator Co., Anderson, Ind.
Steere Engineering Co., Detroit, Mich.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Cleveland Rotary Meter Co., Cleveland, Ohio
The Sprague Meter Co., Bridgeport, Conn.

REPAIRS (Gas Meters and Appliances)

Helme & McIlhenny, 1349 Cherry St., Philadelphia, Pa.
Maryland Meter Works, Baltimore, Md.

RETORTS

Gas Machinery Co., Cleveland, Ohio
Harbison-Walker Refractories Co., Pittsburgh, Pa.
The Parker-Russell Mining & Mfg. Co., St. Louis, Mo.

RUST PREVENTATIVE

Superior Laboratories, Grand Rapids, Mich.

SCRUBBERS

Camden Iron Works, Camden, N. J.
Gas Machinery Co., Cleveland, Ohio
Isbell-Porter Co., Newark, N. J.
Steere Engineering Co., Detroit, Mich.
The Bartlett Hayward Co., Baltimore, Md.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio
The Stacey Mfg. Co., Cincinnati, Ohio

SERVICE BOXES, CLAMPS, Etc.

Camden Iron Works, Camden, N. J.
General Fire Extinguisher Co., Providence, R. I.
Hays Mfg. Co., Inc., Erie, Pa.
H. Mueller Mfg. Co., New York, N. Y., and Decatur, Ill.

STILLS (Benzol, Toluol)

The Walter E. Lummus Co., Boston, Mass.

STOVES (Confectioners, Laundry, Tailor)

Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

STRUCTURAL STEEL WORKS
(Holders, etc.)
Camden Iron Works, Camden, N. J.
Cruse-Kemper Co., Ambler, Pa.
The Bartlett Hayward Co., Baltimore, Md.
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio
The Stacey Mfg. Co., Cincinnati, Ohio

TANKS (Ammonia, Oil, Water)
Camden Iron Works, Camden, N. J.
Cruse-Kemper Co., Ambler, Pa.
Gas Machinery Co., Cleveland, Ohio
National Tube Co., Frick Bldg., Pittsburgh, Pa.
Steere Engineering Co., Cincinnati, Ohio
The Bartlett Hayward Co., Baltimore, Md.
The Stacey Bros. Gas Construction Co., Cincinnati, Ohio
The Stacey Mfg. Co., Cincinnati, Ohio

THERMOMETERS
American Meter Co., 105 W. 40th St., New York, N. Y.
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Gas Machinery Co., Cleveland, Ohio
General Fire Extinguisher Co., Providence, R. I.
Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.

THERMOSTATS
Gas Machinery Co., Cleveland, Ohio
Kidde & Co., 169 Chambers St., New York, N. Y.
Minneapolis Heat Regulator Co., Minneapolis, Minn.
B. Ryan & Co., 60 E. 10th St., New York, N. Y.
The Bryant Heater & Mfg. Co., Cleveland, Ohio

THERMO VALVES
Pittsburgh Water Heater Co., Pittsburgh, Pa.

THORIUM
Welsbach Co., Gloucester, N. J.

TRENCH WORK
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.

VALVES
Connelly Iron Sponge & Governor Co., 227 Fulton St., New York, N. Y.
Gas Machinery Co., Cleveland, Ohio
General Fire Extinguisher Co., Providence, R. I.
Isbell-Porter Co., Newark, N. J.
Steere Engineering Co., Detroit, Mich.
The Bryant Heater & Mfg. Co., Cleveland, Ohio
The Improved Appliance Co., 419 Kent Ave., Brooklyn, N. Y.
The Improved Equipment Co., 60 Wall St., New York, N. Y.
The Stacey Mfg. Co., Cincinnati, Ohio

WATER HEATERS
Bartlett & Co., Inc., Philadelphia, Pa.
Abram Cox Stove Co., Philadelphia, Pa.
Wm. M. Crane Co., 16 W. 32d St., New York, N. Y.
Detroit Stove Works, Detroit, Mich.
Eclipse Gas Stove Co., Rockford, Ill.
Estate Stove Co., Hamilton, Ohio
General Gas Appliance Co., 103 Park Ave., New York, N. Y.
Humphrey Co., Kalamazoo, Mich.
Kidde & Co., 169 Chambers St., New York, N. Y.
Lawson Mfg. Co., Pittsburgh, Pa.
Long-Landreth-Schneider & Co., New Brunswick, N. J.
Peninsular Stove Co., Detroit, Mich.
Philadelphia Stove Co., Philadelphia, Pa.
Pittsburgh Water Heater Co., Pittsburgh, Pa.
Rathbone, Sard & Co., Albany, N. Y.
Ruud Mfg. Co., Pittsburgh, Pa.
The Baltimore Gas Appliance & Mfg. Co., Baltimore, Md.
The Bryant Heater & Mfg. Co., Cleveland, Ohio
The Cleveland Heater Co., Cleveland, Ohio
The Hoffman Heater Co., Lorain, Ohio
The Michigan Stove Co., Detroit, Mich.

WATER STILLS (Gas Heated)
Young Bros Co., Detroit, Mich.

WELDED STEEL PIPE
The Bartlett Hayward Co., Baltimore, Md.
Steere Engineering Co., Detroit, Mich.

A Valuable Service

Have you, as a manufacturer company member of the American Gas Association, considered the value of this list to your prospective customers? We suggest that you call their attention to it.

The services offered by the Association increase in value directly in proportion to the numbers that make use of them.

BIBLIOGRAPHY OF GAS LITERATURE

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The Gas Age—Progressive Age Publishing Co. (52 Vanderbilt Ave., New York, N. Y.).
Gas Industry—The Periodicals Publishing Co., Inc. (Buffalo, N. Y.).
Gas Record (20 W. Jackson Blvd., Chicago, Ill.).
Int. G. Jour. of Canada—Intercolonial Gas Journal of Canada (90 Caroline St., N. Hamilton, Canada).
Jour. Acet. Ltg.—Journal of Acetylene Lighting (Acetylene Journal Publishing Co., Peoples Gas Bldg., Chicago, Ill.).
Natural Gas and Gasoline Journal—The Periodicals Publishing Co., Inc. (Buffalo, N. Y.).

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Gas Jour.—Gas Journal (Walter King, Publisher, 11 Bolt Court, Fleet St., London, E. C.).
The Gas World (John Allen & Co., 8 Bouverie St., London, E. C. 4).

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Bulletin Empire State Gas & Electric Association (29 W. 39th St., New York, N. Y.).
N. E. L. A. Bulletin—National Electric Light Association (29 W. 39th St., New York, N. Y.).
Trans. I. E. S.—Illuminating Engineering Society (29 W. 39th St., New York, N. Y.).
Jour. R. Soc. of Arts—Journal of the Royal Society of Arts (John St., Adelphi, London, W. C. 2).
A Thousand and One Uses for Gas (British Commercial Gas Association, 47 Victoria St., Westminster, London, S. W., England).

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The Doherty News (Doherty Publishing Corporation, 60 Wall St., New York, N. Y.).
Gas and Electric News (Rochester Railway & Light Co., Rochester, N. Y.).
Gas Logic (Consolidated Gas Co., New York, No. 1 Madison Ave., New York, N. Y.).
Pacific Service Magazine (Pacific Gas & Electric Co., San Francisco, Cal.).
Service (Public Service Gas Co., Newark, N. J.).
Southern Public Utilities Magazine (Charlotte, N. C.).
U. G. & E. E. Bulletin (United Gas & Electric Engineering Corporation, 61 Broadway, New York, N. Y.).

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Aera (American Electric Railway Association, 8 W. 40th St., New York, N. Y.).
General Electrical Review (General Electric Co., Publication Bureau, Schenectady, N. Y.).
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Public Service (122 S. Michigan Ave., Chicago, Ill.).
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NOTE.—The following list includes references to articles published from March 20 to April 20, 1919.

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Affiliation Agreement		A. G. A. Monthly, Mar., 128
Conference, March 13-14		A. G. A. Monthly, Mar., 105
Organization Plan		A. G. A. Monthly, Mar., 127
Presidential Address	G. B. Cortelyou	A. G. A. Monthly, Mar., 99
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Committee Reports		
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Cast Iron Pipe Joints		A. G. A. Monthly, Mar., 115
Chemical		A. G. A. Monthly, Mar., 115
Consumers Meters		A. G. A. Monthly, Mar., 117
Electrolysis		A. G. A. Monthly, Mar., 113
Membership		A. G. A. Monthly, Mar., 129
Refractory Materials		A G. A. Monthly, Mar., 117
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Exhibitors, Appliance		Gas Jour. of C., Apr., 149
		Gas Age, Apr. 15, 437
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Presidential Address	F. E. Luther	Gas Industry, Apr., 101
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Presidential Address	J. Dickson	Gas Jour., Apr. 8, 73, 86
Wisconsin Gas Assn. (Milwaukee, Mar. 25-26)		Gas Record, Apr. 9, 221
		Gas Industry, Apr., 118
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Ammonia Centralizing Sales		Gas World. Mar. 22, 208
		Gas Jour., Mar. 25, 647
Ammonia, Sulphate of		Gas World, Mar. 29, 343
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		Am. G. E. Jour., Apr. 19, 331
Benzol Standard		B. C. G. A. Bul., Apr., 67
Benzol Testing by Freezing	E. de St. Claire-Deville	Gas Age, Apr. 15, 418
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By-Product Considerations	L. W. Alwyn-Schmidt	Am. G. E. Jour., Apr. 12, 309
By-Product Plant, Brier Hill (Youngstown, O.)	F. T. Moran	Gas Age, Apr. 1, 351
By-Products, Importance of	A. G. Atwater	Gas Age, Apr 1, 339
Carbon Black, Making Stopped		Gas Age, Apr. 1, 373
Coke Oven Gas	Editorial	Gas Jour., Apr. 8, 74
Coke Oven Practice in U. S.	R. Gunderson	Gas Age. Apr. 15, 407
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Light Oil Plants		Gas Industry, Apr., 96
Light Oils, Scrubbers Retain	C. S. Heath	Gas Age, Apr. 15, 425
Motor Fuel		Gas & Elec. News, Mar., 200
Naphthalene Elimination	Dr. Knublauch	Gas World, Apr. 5, 24
Recovery Plants, Scrapping of		Gas Age, Apr. 15, 415
Tar "H. B." Dehydration Plant	F. L. Ball	Gas World, Apr. 5, 264
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Pipe, Colonial Bermico Fiber		Gas Age, Apr. 15, 430
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Rubber Hose Causes Explosion		Gas Record, Apr. 9, 226

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Expenditures, Classifying of	J. M. Dickie	N. E. L. A. Bul., Mar., 140
High Price Level, Future of	I. Fisher	Gas Age, Apr. 1, 348
Market Conditions, Analysis of (A. G. A. Conf. paper)	E. S. Dickey	A. G. A. Monthly, Mar., 119 Gas Industry, Apr., 110 Gas Age, Apr. 1, 354
Merchandising, Vital Issues		N. E. L. A. Bul., Mar., 146
Profit Sharing Plan (Sears-Roebuck & Co.)		Printers Ink, Apr. 10, 57
Rate Board, Proposed U. S.		Gas Record, Apr. 9, 226
Rate Making	C. F. Elmes	Gas Age, Apr. 15, 427
Stabilizing the Dollar	Prof. I. Fisher	Labor Review, Mar., 10
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Helium in Demand	B. B. Baker	Gas Age, Apr. 15, 456
Hygiene, Industrial	Dr. A. Hamilton	Labor Review, Feb., 199
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Council of National Defense Proposed		Gas Age, Apr. 1, 347
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Natural Gas Efficiency, Discount		Gas Age, Apr. 1, 366
Operating With Low Grade Materials	G. I. Vincent	Gas Age, Apr. 1, 353
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Producer Plant, Operation of	J. S. McClimon	Gas Age, Apr. 15, 421
Providence Water Gas Plant	W. M. Russell	Gas Age, Apr. 1, 364
Purification and Purifier Design—Conclusion	F. W. Steere	Gas Age, Apr. 1, 361
Steaming Horizontal Retorts	T. H. Sargent	Gas World, Mar. 22, 205
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Water Gas Machine Factors	R. B. Harper	Gas Record, Mar. 26, 188
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NEW BUSINESS—SALES DEPARTMENT.		
Advertising Go-ahead Spirit Stimulates Buying	B. McLeary	Printers Ink, Apr. 12, 37
Business, Telephone Promoting		Sales Service, Apr., 6
Copy Writing to Sell Goods		Am. G. E. Jour., Apr. 5, 302
Diagrams Tell Story Quickly		Printers Ink, Apr. 24, 25
Gas Business Won Against Lowest Electric Rate	G. W. Allen	Gas Age, Apr. 15, 450
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"Merchandising" Misused Word	F. Kelsey	Gas Industry, Apr., 102 Am. G. E. Jour., Apr. 5, 296 Gas Age, Apr. 15, 447
"One Cent" Sale Successful		Gas Record, Apr. 9, 227
Profits from Big Consumers	E. J. Caspers	Gas Age, Apr. 1, 406 Gas Industry, Apr., 107
Sales Policies, Future		Gas Industry, Apr., 93
Selling Methods, Gas Business (A. G. A. Conference paper)	J. P. Hanlan	Gas Age, Apr. 1, 397
Signs, Flashing Gas Light		B. C. G. A. Bul., Apr., 67
Systematic Canvass Results	R. O. Jasperson	Am. G. E. Jour., Apr. 5, 295 Gas Record, Apr. 9, 213
The U. G. I. Contracting Co.		Gas Age, Apr. 1, 370
Window Display Advertising		Am. G. E. Jour., Apr. 5, 298 B. C. G. A. Bul., Apr., 71
UTILIZATION OF GAS.		
Belt Driving in Gas Works	F. R. Parsons	Gas World, Mar. 29, 239
Color, Some Novel Ideas		Gas Logic, Apr., 8
Domestic Service Troubles		B. C. G. A. Bul., Apr., 70
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Gas Education in Schools	F. E. Luther	Gas Record, Apr. 9, 235
Gas Furnaces in Big Shipyard	W. J. Harris, Jr.	Gas Age, Apr. 1, 400
Gas Heater Purifies Air	J. C. Tate	Gas Age, Apr. 1, 382
Gas Heaters Ripen Bananas		Gas Record, Apr. 9, 229
Gas Heating Dance Hall, Ideal	H. E. Branch	Gas Age, Apr. 1, 394
Gas Heating Furnace Tests	O. L. Kowalke	Gas Record, Apr. 9, 231 Gas Age, Apr. 15, 444
Gas Heats Office Building	E. D. Milener	Gas Age, Apr. 1, 389
Gas Roasting Peanut Butter		Gas Age, Apr. 15, 432
Hat Making with Gas		Gas Logic, Apr., 5
Heat, Light and Motive Power	Sir D. Clerk	Gas World, Mar. 22, 210; Mar. 29, 227, 228 Gas Jour., Mar. 25, 625, 637 B. C. G. A. Bul., Apr., 59
Kitchen, The Biggest All-Gas	C. H. French	Gas Age, Apr. 1, 390
Lighting Systems	F. Pykett	Gas World, Mar. 29, 237 Gas Jour., Apr. 1, 30
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Water Heaters	H. B. Andersen	A. G. A. Monthly, Mar., 140

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